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ABSTRACT

This is a course designed specifically for use in eastern North Carolina or a similar geographic region but this does not preclude the use of its concepts and basic structure for other geographic regions. Plans and activities are student-centered and many are problem-solving oriented and, therefore, may be modified without disrupting the conceptual scheme. Topography, geographical history, conservation, and salt water marshes are the major topics of study, selected to develop an understanding of the impact that management and utilization of natural resources have on the economic, social, and general welfare of man. Each unit begins with a general overview indicating the title of the unit, time allotment, purpose or objective, and abstract of content. This is followed by an outline of the pre-, major, and post-activities which compose the unit, their required time periods, and a list of supplemental activities/questions/references for the teacher. Each activity enumerates, where appropriate, background information, major points to emphasize, pertinent questions, teaching procedures, materials required, and related information. A variety of media and processes is suggested to allow for flexibility. This work was prepared under a contract for an ESEA Title III project, "Environmental Science Study Curriculum." (BL)

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The Conservation of North Carolina's Natural Resources

SE 016 414

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ENVIRONMENTAL SCIENCE STUDY CURRICULUM

ESEA Title III Project

P. S. Jones Junior High School

Washington, North Carolina

27889

PUBLISHER'S NOTE

Environmental Science Study Curriculum, (ESSC) is an ESEA Title III project funded through the State of North Carolina. One purpose of project ESSC is to develop a curriculum in environmental education at the eighth and ninth grade levels. The structure of the curriculum is based on the mini-course design. Currently, there are six twelve-week mini-courses, "The Conservation of North Carolina's Natural Resources" being one such course. Although the materials contained herein are designed for the specified grade levels, they could be utilized over a wider span of grades with relatively little revision.

Another purpose of the project is to review as much of the available and existing materials as possible and to utilize them wherever possible. Therefore, not all of the materials and ideas contained herein are the original work of Project ESSC, rather some of this material is the result of using, evaluating, reworking, combining, synthesizing and re-evaluating existing materials from many varied sources. It is for this reason, however, that we are unable to credit all the original sources on those materials that are not original ideas of Project ESSC.

It is the hope of Project ESSC that this material and these unit plans are presented in such a manner that they will be readily usable. This entire course or any part thereof may be reproduced without any further permission from Project ESSC. However, we do ask that credit be given if the total course is reproduced.

INTRODUCTION

"The Conservation of North Carolina's Natural Resources" is a course designed specificially for use in eastern North Carolina. Plans and activities associated with this course are relevant only to those students who live in eastern North Carolina or a similar geographic location. This, however, does not preclude the use of the concepts and basic structure of the course for other geographic regions. Modification of activities to fit any region is possible, without disrupting the conceptual scheme.

This course is designed for a period of twelve weeks, yet through its design of four separate units it remains flexible enough to be broken into smaller wholes. Flexibility also allows for varied instructional methods and student abilities. The entire course is designed around a series of activities with a pre and post- activity for each. It may be found useful to utilize only certain sets of these "activity packages". All activities are student-centered and many are problem-solving oriented in hopes that problem-solving and decision-making skills will be enhanced.

It is the hope of Project ESSC that the flexible nature of the structure and design will enable every teacher to utilize at least part of this very important curriculum content.

THE CONSERVATION OF NORTH CAROLINA'S NATURAL RESOURCES

SYLLABUS

ABSTRACT

To develop an understanding of the impact that management and utilization of natural resources have on the economic, social, and general welfare.

OBJECTIVES

1. For students to understand North Carolina as an ecosystem.
2. For students to be proficient in the skills necessary to formulate their own opinions based on factual, tested, and relevant knowledge about the conservation and management of North Carolina's natural resources.
3. For students to be knowledgeable of man's changing attitudes and values toward conservation of natural resources throughout history and the social and economic affects of these changing attitudes and values of the components of the environment - natural resources.

CONCEPTS

1. The physical features of each of the three physical divisions of North Carolina are interrelated and are related to the development of each particular area.
2. Certain natural resources are located specifically in each of the three physical divisions and are key factors in maintaining a natural balance.
3. Man is totally dependent upon his environment.
4. Man is a part of the environment and not segregated from it.
5. Our economic, social and general welfare are largely dependent upon the manner and extent to which we utilize and manage our natural resources.

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THE CONSERVATION OF NORTH CAROLINA'S NATURAL RESOURCES

Unit I: Topography

Introduction	1 period
Pre-Activity	2 periods
Activity	2½ periods
Post-Activity	1½ periods
	7 periods

Films:

Pre-Activity: 1. Filmstrip series "The North Carolina Filmstrip Series"

2. Filmstrip series
   a. "Ecology and The Agricultural Environment"
   b. Filmstrip - "The Conservation of Our Resources - The Waste of Our Resources"

Post-Activity: 1. "Man's Basic Need; Natural Resources"

11 min. Encyclopedia Britannica

Schedule dates: _____ or _____

TO THE TEACHER

Teacher Supplements - Unit I

Pre-Activity

#1 Teacher Information for the Tape - "Squandering Our Natural Resources"

Activity

#2 Map of North Carolina (Topography)

#3 Topographic Divisions of North Carolina

#4 Student Bibliography - Topography

Post-Activity

#5 "Man's Basic Need: Natural Resources"

#6 Quiz: The Topographic Divisions and the Natural Resources of North Carolina

#7 Key to Quiz

COURSE: CONSERVATION OF NORTH CAROLINA'S NATURAL RESOURCES

UNIT I PLAN

UNIT I TITLE: Topography of the State

TIME: 7 periods

PURPOSE OR OBJECTIVE:

For students to become cognizant of topographic features as natural resources of the state, and the interrelationship between these physical features and the development of particular areas within the state.

ABSTRACT:

This unit lays the groundwork for the students' understanding of natural resources. Utilizing a study of topographic features of the state, an introduction is made to natural resources---what they are, what is present in the state, where they are located, and why they are vital.

PRE-ACTIVITY PLANS

UNIT I: TOPOGRAPHY OF THE STATE

TIME: 3 periods

I. Introduction to the course: "Conservation of North Carolina's Natural Resources"

A. Teaching techniques (after reviewing the material, the various methods employed will be evident)

B. Use of reference books and materials

C. Student opinions and suggestions for the course

1. Pose questions which will encourage students' opinions and ideas for course.
2. Discuss responses with students.

II. Unit Introduction (Topography)

A. Objective of this unit (refer to introduction page - purpose or objective)

B. "Squandering Our Natural Resources" (6171 L) - 28 minutes
Cassette tape
1. Class discussion on tape topic (Refer to Supplement #1)

C. Other topics to discuss in the introduction and during the class discussion:
1. What are natural resources?
2. Why are natural resources vital?
3. State some of the natural resources which our state has.
4. Where are these located and why?
5. What can be done to conserve natural resources for future generations?
6. Why will a study of topography aid our understanding of natural resources?

D. Class discussion questions (additional)
1. Make a list of the things you use every day that come from our natural resources.
2. What are some conservation problems facing Washington? What could be done about these?
3. We of the present generation are heirs to a great fortune in natural resources. Is it enough for us to work hard to supply our own wants? Do we owe anything to the generations that will follow us? What do we owe?

TEACHER DIRECTIONS
1. Period 1: It should be possible to complete through Section II, B.

UNIT I: Topography Of The State (Cont.)

2. Period 2: Divide students into groups of three or four to discuss the six questions in section II C. Each group is to answer all the questions and watch the filmstrip "The Conservation of Our Resources - The Waste of Our Resources". (Refer to Supplement #4 for Film Notes).

3. Period 3: With all the students together again discuss the six questions given in (II C, 1-6) and to provoke deeper thinking discuss the three questions in Section II D.

SUPPLEMENT # 1

Teacher Information For The Tape "Squandering Our Natural Resources"

A discussion on this topic is vital to this unit and should be included. The tape is recommended as a source for this topic. In the event the teacher cannot obtain the tape a summary of the tape is given:

> When Thomas Jefferson made the Louisiana Purchase, he felt he had solved the problem of growth and natural resources for the United States for hundreds of years to come. Today, with over twice the territory than in Jefferson's time, the country is in trouble. Less than 3% of the land remains in its natural state, most American rivers are not more than open sewers, and 50 million Americans live in communities where real or potential water shortage is a real problem. In addition, this country is currently using 50% of the natural resources of the non-communist world. Whether - and for just how long - the United States can continue in this vein is the subject of this stimulating panel discussion featuring conservationist Fairfield Osborne, Time Magazine editor Jonathan Leonard, and New York Times editor John B. Oakes. The urgency with which they confront the problem suggests that it is likely to become a long - range rather that a short-lived issue.

Questions which might be asked to stimulate discussion are as follows:

1. We are the richest nation in the world. Do we have enough natural resources to maintain our living standards in the future?

2. What is your reaction to this statement: Americans are using over 50% of the natural resources of the non-communist world.

3. Why are our natural resources being squandered?

4. What could be done to prevent the squandering of natural resources?

5. What is meant by "intangible resources"?

UNIT I: TOPOGRAPHY OF THE STATE

INTRODUCTION TO ACTIVITY

TITLE: Topographic Divisions of North Carolina

TIME: $2\frac{1}{2}$ periods

INTRODUCTION:

This activity leads to an understanding that topographic features -- mountains, rivers, forests, water, and soil are natural resources. Thus resources located in certain areas of the state with certain unique characteristics are directly related to the development of these areas.

MATERIALS:

1. Student worksheet - Topographic Divisions of North Carolina - Note Supplement #3
2. Student handout - Map of North Carolina - Note Supplement #2
3. Student bibliography (handout) - Note Supplement #4
4. Reference books on the topography of the state - Note Supplement #4

ACTIVITY PLANS

TEACHER DIRECTIONS

Students are to complete the worksheet, Topographic Divisions of North Carolina, which follows. You should also have available the following sheets of information to give to the students:

1. Map of North Carolina (Topography) - Supplement #2
2. Student Bibliography - Supplement #4

Specific directions are given on the worksheet for answering worksheet questions and completing the map.

STENCIL

TOPOGRAPHIC DIVISIONS OF NORTH CAROLINA

Directions: Read and complete the following information. Hint: Use your bibliography!

I. Obtain the following book from the resource center or your teacher.

Reference:

AN INTRODUCTION TO THE TOPOGRAPHY, GEOLOGY, AND MINERAL RESOURCES OF NORTH CAROLINA by Broadhurst S342

What to do:

1. Read the preface.
2. Read pages 1 - 4.
3. Take notes on what you read.
4. Put notes on notebook paper.

II. Obtain a map of North Carolina from your teacher.

What do do:

1. On the map complete all blanks under "Legend".
2. List the three topographic divisions of North Carolina. Color each of the topographic divisions so that the extension of each is evident.
3. List five characteristics of each of the three topographic divisions of North Carolina as they exist today. List the characteristics in the blanks given on the map.
4. Label any necessary geographic location in each of the three topographic divisions.

III. Key words:

What to do: Define each of the following words. Place answers on the back of the North Carolina map.

1. Natural Resources
2. Topography
3. Conservation
4. Geology
5. Ecosystem

IV. Obtain the four transparencies--United States, Soil Erosion, Water Pollution, Air Pollution--from your teacher. ("Ecology and Agriculture" Kit)

What to do: Answer the following questions using the correct transparency. Copy the question and answer on the back of the map.

Soil Erosion Transparency

1. Where does most soil erosion occur in North Carolina? (coastal plains, piedmont, mountains)

Soil Erosion (Cont.)

2. In the United States where does the most soil erosion occur and why? (East, Midwest, West)

Water Pollution Transparency

3. Does North Carolina have a water pollution problem? Give a reason for your answer.
4. True or False: Every major river in the United States is polluted.
5. True or False: The coast of North Carolina has a water pollution problem.

Air Pollution Transparency

6. list at least four major cities in North Carolina with air pollution problems.

V. Obtain the filmstrip kit -- "The North Carolina Filmstrip Series" from your teacher.

What to do:

Watch and take notes on the films.

VI. Obtain the filmstrip kit -- "Ecology and the Agricultural Environment" from your teacher.

What to do:

Watch and take notes on these films:

Required:

1. "Ecology and the Agricultural Environment"
2. "People and the Agricultural Environment"

Extra Credit

3. "Soil and the Agricultural Environment"
4. "Water and the Agricultural Environment"
5. "Air and the Agricultural Environment"

VII. How would you classify North Carolina's environment (urban, agricultural, industrial Why?

Additional Extra Credit

VIII. Which of the three topographic divisions ranks first as the home of Man?

IX. Why is a study of the topographic history of North Carolina important and relevant? Support with a reference.

X. What natural force has largely determined the shape of our state? What is meant by the term?

XI. What are the two sections of the Appalachians? What is the range of elevation for each?

SUPPLEMENT # 2 - Map Of North Carolina (Topography) Name _____

Topographic Division: _____

List 5 Characteristics:

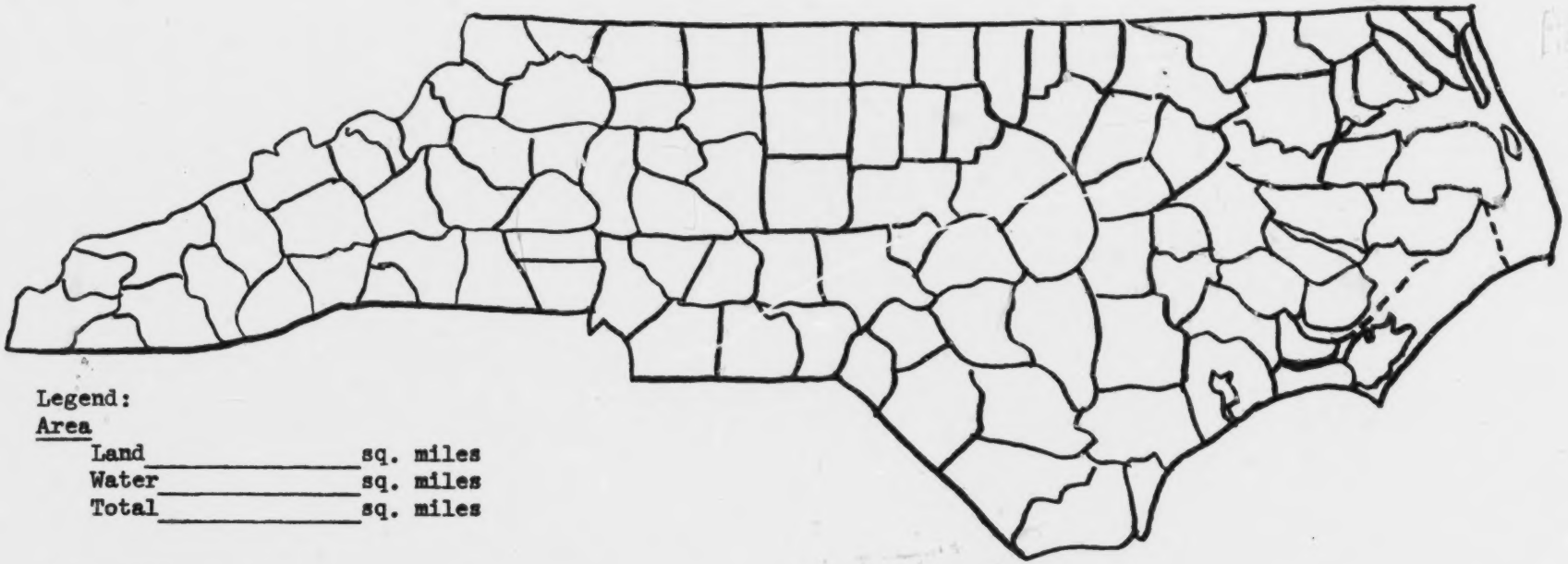
Topographic Division: _____

List 5 Characteristics

Topographic Division: _____

List 5 Characteristics

To The Teacher:
A list of the counties in each topographic division must be given to the students as these are not identified on the maps (Supplement #2 and #3).



Legend:

Area
- Land _____ sq. miles
- Water _____ sq. miles
- Total _____ sq. miles

Dimensions
- Length _____ miles
- Width _____ miles

Geographic location

Between _____ and _____ North Latitude
and _____ and _____ West Longitude

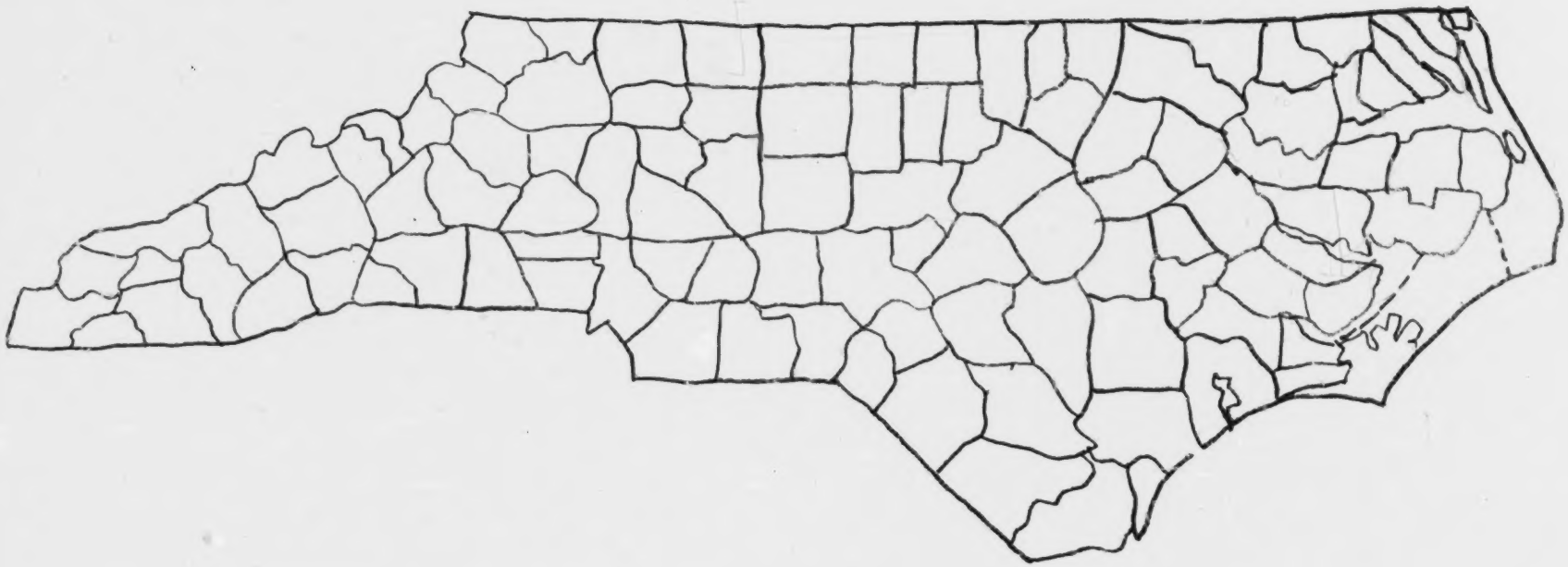
Topographic Divisions

Name	Color
1. _____	
2. _____	
3. _____	

Supplement #3

MAP OF NORTH CAROLINA

TOPOGRAPHIC DIVISIONS OF NORTH CAROLINA



SUPPLEMENT #4

Student Bibliography

UNIT I: Topography

Becker, RESOURCES FOR TOMORROW Holt, Rinehart, & Winston, Inc.

Broadhurst, AN INTRODUCTION TO THE TOPOGRAPHY, GEOLOGY, AND MINERAL RESOURCES OF NORTH CAROLINA North Carolina Department of Conservation and Development, (p. 2-4)

Lemert, NORTH CAROLINA GEOGRAPHY Harlow Publishing Corporation

Lonsdale, ATLAS OF NORTH CAROLINA The University of North Carolina Press, (p. 2-5)

Phillips, PHYSICAL GEOGRAPHY American Education Publications
(Plains p. 22; Plateaus p. 24; Hills p. 25; Mountains p. 26)

Ramsey, MODERN EARTH SCIENCE Holt, Rinehart & Winston, Inc.
(Plains p. 232-233; Plateaus p. 251-265; Mountains p. 238-251)

Stuckey, GEOLOGY AND MINERAL RESOURCES OF NORTH CAROLINA North Carolina Department of Conservation and Development, (p. 347)

U. S. Department of the Interior, LANDFORMS OF THE UNITED STATES

Welch, AN INTRODUCTION OF SOIL SCIENCE IN THE SOUTHEAST . The University of North Carolina Press (Plains p. 22; Plateaus p. 24; Mountains p. 25)

Filmstrips:

"The North Carolina Filmstrip Series" National School and Industrial Corporation, Raleigh, North Carolina

"Ecology and Agriculture" Vocational Education Productions, (Multi-media Kit)

Required:

1. "Ecology and the Agricultural Environment"
2. "People and the Agricultural Environment"

Extra:

3. "Soil and the Agricultural Environment"
4. "Water and the Agricultural Environment"
5. "Air and the Agricultural Environment"

"The Conservation of Our Resources - The Waste of Our Resources" Eye Gate House Incorporated

POST-ACTIVITY PLANS

UNIT I: TOPOGRAPHY OF THE STATE

TIME: 1½ periods

I. Film

A. "Man's Basic Need; Natural Resources" (Note Supplement #5)

Encyclopedia Britannica (11 minutes)

B. Discuss key concepts of film

II. Review and discuss work done on topography of the state

TIME: 1 period

A. Questions

1. What are the topographic divisions of the state?

2. What are the characteristics of the divisions?

B. Teacher Preparation

1. Natural Resources -- the advantages nature has given us

2. Three major divisions of North Carolina
   --coastal plains
   --piedmont plateau
   --mountains

3. Rivers
   --coastal plains - Chowan, Roanoke, Tar, Neuse, Cape Fear
   --piedmont - Yadkin, Catawba
   --mountains - most flow into the Mississippi

4. Soil
   --coastal plains - heavy black to sandy soil
   --piedmont - clay
   --mountain - mountainous, some fertile areas

5. 70% of minerals have commercial value

III. Quiz (25 minutes) (Note Supplement #6)

The Topographic Divisions and Natural Resources of North Carolina

SUPPLEMENT # 5

"Man's Basic Need; Natural Resources"

Introduces students to the concept of natural resources. Points out the importance of natural resources to man's existence. Shows how the people of one community effectively use the natural resources of their environment. Stimulates students to discuss the natural resources in their own environment.

STENCIL

SUPPLEMENT # 6

QUIZ: The Topographic Divisions and The Natural Resources of North Carolina

1. The topographic region characterized by swamps, marshes, a ragged coastline, low sandy soil is : (a) piedmont (b) mountains (c) coastal plains

2. The Pamlico River is located in the: (a) mountains (b) piedmont (c) coastal plains

3. The cities of Raleigh, Charlotte, Greensboro, Durham, and Winston-Salem have an air pollution problem: (a) true (b) false

4. Most soil erosion in North Carolina occurs in: (a) mountains (b) coastal plains (c) piedmont

5. Every major river in the United States is polluted: (a) true (b) false

6. The Yadkin River is located in the: (a) mountains (b) coastal plains (c) piedmont

7. Natural resources may be defined as :

   (a) inorganic elements found in the earth's crust which are non-renewable
   (b) the organic materials found in and on the earth
   (c) the advantages or assets nature has given us; the living and non-living things such as soil, water, wildlife . . .

8. The mountains and coastal plains are topographically alike. (a) yes (b) no

9. The city of Raleigh is located in the: (a) coastal plains (b) piedmont (c) mountains

10. Which of the following natural resources are found in North Carolina? (a) wildlife (b) soil (c) minerals (d) all of these

11. The coastal plains has several major rivers. Which of the following are located in this region: (a) Pamlico (b) Yadkin (c) only a (d) both a and b

Supplement #6 (Cont.)

12. The largest mining operation of minerals in eastern North Carolina involves the mining of: (a) coal (b) diamond (c) phosphates (d) none of these

13. Conservation is not really important to a person in North Carolina because the state really has no serious environmental problems. (a) true (b) false

14. North Carolina's environment could be classified as: (a) urban (b) industrial (c) agricultural

15 - 17. What are the three topographic divisions of North Carolina?

1._____ 2. _____ 3. _____

18 - 22. List five natural resources found in North Carolina.

18. _____ 19. _____ 20. _____

21. _____ 22. _____

23. Why do North Carolinians want to use their natural resources?_____

_____

_____

24. What does the term conservation mean to you?_____

_____

25. (Some, None, All) of North Carolina's natural resources are renewable.

Matching

_____26. natural resources

_____27. conservation

_____28. piedmont

_____29. mountains

_____30. Raleigh

a. the topographic division which has the most soil erosion

b. the wise use and preservation of natural resources

c. the advantages or assets nature has given us

d. a city which has an air pollution problem

e. one of the topographic divisions of North Carolina

Supplement #6 (Cont.)

*Note for 31 - 42 -- Have a mimeographed map to give each student. (Supplement #3)

31 - 42. List three counties found in each of the three topographic divisions. Name the topographic division and then list the three counties.

topographic division 31. _____

counties 32. _____

33. _____

34. _____

topographic division 35. _____

counties 36. _____

37. _____

38. _____

topographic division 39. _____

counties 40. _____

41. _____

42. _____

43. Tell which topographic division is represented by the number given on the map.

number one _____

number two _____

number three _____

SUPPLEMENT # 7

Key to Quiz

1. C
2. C
3. A
4. A
5. A
6. C
7. C
8. B
9. B
10. D
11. C or A
12. C
13. B
14. C
15. coastal plains
16. piedmont
17. mountains
* 18. wildlife
* 19. soil
* 20. water
* 21. climate
* 22. air
23. because natural resources add to our lives -- enable us to have a quality environment and better living standard
24. wise use and preservation of natural resources
25. some
26. C
27. B
28. C
29. A
30. D
31 - 42. Topographic division and any three counties
43. number one coastal plains
number two piedmont plateau
number three mountains

*Any 5 natural resources in North Carolina.

THE CONSERVATION OF NORTH CAROLINA'S NATURAL RESOURCES

Unit II: Geographical History of North Carolina

Filler Day	1 period
Pre-Activity	1-2 periods
Activity	4 periods
Post-Activity	4 periods
	10 or 11 periods (Depending on use of filler day)

Films:

Pre-Activity: 1. "The Earth in Change: The Earth's Crust"

16 minutes Encyclopedia Britannica

Schedule dates: _____ or _____

TO THE TEACHER

Teacher Supplements - Unit II

Pre-Activity

8 Teacher Preparation: Geology, Topography, Natural Resources

9 "The Earth in Change: The Earth's Crust"

#10 The Geographical History of the State: Teacher Information

#11 Student Worksheet

#12 Key to Student Worksheet

Activity

#13 Bibliography to Activity

Post-Activity

#14 Geological Field Study: Student Worksheet

#15 Schedule and Other Information

#16 Quiz (Optional)

COURSE: CONSERVATION OF NORTH CAROLINA'S NATURAL RESOURCES

UNIT II PLAN

UNIT II TITLE: Geographical History of the State

TIME: 10 or 11 periods

PURPOSE OR OBJECTIVE:

For the students to become knowledgeable of the main geologic eras and the characteristics of each and to recognize the affect of geologic change on natural resources and their subsequent utilization.

ABSTRACT:

Geology is the science which studies the origin, history, and structure of the earth and its life, especially as recorded in the rocks. This unit is designed so that the students will study the main geologic events of the state. Relating this knowledge of geologic processes and their affect upon the formation of the main land features will enhance the study of natural resources. Not only will students gain their knowledge of geologic processes from various reference books, but also from a detailed field study of geologic formations present in their geographical area.

PRE-ACTIVITY

And

ACTIVITY PLANS

UNIT II: GEOGRAPHICAL HISTORY OF THE STATE

TIME: 6 periods

TO THE TEACHER: Students are to spend class time copying (optional) and answering the worksheet questions. A tentative schedule is given:

1 to 2 periods - students make a copy of the worksheet; the film "The Earth in Change: The Earth's Crust" may be shown (optional)
1 period - questions 1-4, I, II, III, IV
1 period - V, VI, D, E,
1 period - questions 5-8
1 period - review of the worksheet

Each student will need a copy of the bibliography (Supplement # 13) to use while answering the worksheet questions.

Teacher preparation

A. Students are to research the geological history of each topographic division within the state and the geographical formation of certain land features such as rivers and mountains. (Utilize Independent Study Prints; Geologic Landforms, Physical Features)

B. Students are to research questions which will give information of the rock formations of each of the three topographic divisions, the economic value of these formations and the geological processes which have occurred (when and during what geological period).

C. When researching the geographical formation of certain land features such as rivers, mountains, etc., students are to obtain information concerning the geographical formation of the various landforms and during which geological period they were formed.

D. Students are to use their data as preparation for the field study.

E. Allow students class time to research the questions.

UNIT II: Geographical History of the State (Cont.)

F. Film: "The Earth in Change: The Earth's Crust"

optional: may be shown before class

G. Note Student Worksheet (Note Supplement #11) and Teacher Information (Note Supplement #10)

H. The questions on the worksheet may be placed on the board.

SUPPLEMENT # 8

Teacher Preparation: Geology, Topography, Natural Resources

Introduction: The following are notes which may be of assistance in informing the teacher of certain geological and topographical features of North Carolina. The notes were taken from several references. Each reference is given and then the notes.

I. Topography, Geology, and Mineral Resources of North Carolina / Broadhurst

A. Location of the state: Atlantic seaboard midway between New England and Florida

Width (N-S) : 185 miles

Length (E-W): 503 miles

Total area: 52,712 sq. miles
(49,067 land)
(3,645 water)

Number of counties: 100

B. Topography: The state lies across three topographic regions
*Note Physical Geography p. 12 (topographic map)

three topographic regions of the state:
(1) coastal plains
(2) piedmont plateau
(3) mountains

Additional references:

(1) Physical Geography (AEP)
plains p. 22; plateau p. 24; hills p. 25; mountains p. 26

(2) Atlas of North Carolina p. 2-5

(3) An Introduction to Soil Science in the Southeast
coastal plain p. 22; plateaus p. 24; mountains p. 25

C. Geology (general facts)

1. The science which deals with the origin, history, and structure of the earth and its life as recorded in rocks

Supplement # 8 (Cont.)

2. During each major geologic time certain rocks were formed.

3. The geologic history of North Carolina is long and complex; its history shows many changes have occurred in the rocks beneath our state.

4. Volcanic activity has been widespread in the piedmont and mountain areas.

5. Several times the ocean covered enormous parts of our state leaving sediment.

6. Geologic processes are still at work in our state.

7. There are four main eras or major divisions of geologic time: oldest to the youngest
   Precambrian
   Paleozoic
   Mesozoic
   Cenozoic (Tertiary and Quaternary Periods)

8. Coastal Plains
   a. rock formations are of these eras: Mesozoic and Cenozoic
   b. composition of the rock formations: sand, gravels, clays, marl
   c. type of rock: sedimentary (rock formed in layers from materials deposited by water (ocean), wind, ice)
   d. relative age of the rock formations: these are the youngest in the state being formed only 125 MYA* to 70 MYA
   e. principle commercial products from the rocks: marl, sand, gravel, are mainly used in construction

9. Piedmont (Blue Ridge)
   a. rock formations are of these eras:
      (1) Mesozoic (Triassic Period); (2) Paleozoic (Carboniferous and Volcanic Slate Series); (3) Precambrian Age
   b. composition of the rock formations:
      (1) Mesozoic (Triassic) - sandstone and shale are sedimentary rocks
      (2) Paleozoic (Carboniferous Age) - granite and diorite are igneous rocks or rocks that were formed by solidification of magma
      Volcanic Slate Series yielded volcanic sedimentary formations because the area was once occupied by active volcanoes; the rocks formed are slates or metamorphic rocks (rocks which have undergone changes in composition or texture through heat, moisture, and pressure)
      (3) Precambrian - gneiss and schist which are metamorphic formations
   c. types of rock: sedimentary, igneous, metamorphic
   d. relative age of the rock formations: the rocks were formed 3,000 MYA to 180 MYA

*MYA--Million years ago

Supplement # 8 (Cont.)

e. principle commercial products from the rocks:
- shale and sandstone are used in the manufacture of brick and tile
- coal is used as a fuel (the only mineable coal in the state is the Cummock coal seam in Chatham, Lee, and Moore counties)
- granite and diorite are used in road base, concrete, and paving
- slate or limestone is used for agricultural and construction purposes
- metamorphic rocks (crushed stone, clays, slate) are used for agricultural purposes

D. Minerals (Notes)
- renewable resources - forests, wildlife, soil, air, water
- non-renewable resources - minerals
- minerals were formed millions of years ago, however, new minerals are being formed in the earth but it takes millions of years
- the three classes of minerals: (a) metals (b) non-metals (c) fuels (hydro-carbons)
- metals - iron, copper, aluminum, magnesium, nickel, zinc, gold, silver
- fuels - coal, oil, natural gas are formed from fats and oils of decayed plants and animals (fossil fuels)
- the importance of minerals: metals and fuels are essential to an industrialized society
- non-metals such as sulfur, graphite, gypsum, clay, borax, halite (common salt), talc, asbestos, shale, quartz, and diamond have great commercial value
- conservation of minerals involves:
  research to uncover new sources of minerals, to develop more efficient ways of extracting the minerals from their ores, and to devise substitute materials for minerals in scarce supply
  laws are needed to regulate drilling and mining

E. Natural Resources (Notes)
- renewable resources depend upon each other -- man depends upon them all
- all living things depend upon the natural world for their existence - this is true of man, for he uses the products of natural resources such as food, clothing, . . .
- there is nothing we use that has not been derived in some way from natural resources
- only man is able to shape nature to his will - this power carries a grave responsibility to use Nature's resources wisely
- conservation: the wise use and management of our natural resources
- man is a part of the vast web of life, the balance of nature
- if he (man) does not conserve his resources, he will be the final victim of his own folly
- our natural resources are related to each other and all are related to man

Supplement # 8 (Cont.)

II. Man and His Resources / Mattison

A. Minerals

1. Coal - organic matter; use of - fuel in industry
peat is being formed in the marshes of the Dismal Swamp of North Carolina.

2. Oil

3. Natural gas

4. Iron and steel

5. Other metals - copper, aluminum, platinum, titanium

B. Search for new mineral deposits is important - geochemistry

III. Conservation of Natural Resources / Smith (teacher) p. 373 - 448

Notes:

1. Mineral materials - ores - result of geological processes operating over a very long period of time
2. Minerals, once mined, processed and put to use, cannot be restored.
3. Many can be used over and over (metals)
4. Conservation - mining and processing methods that result in the least waste with maximum protection of the unmined portion
5. Open-pit mining
6. Conservation problems
   a. corrosion (control of)
      - protective coating
      - alloys
   b. recovery of by-products
   c. substitutes
   d. stockpiling

IV. Additional References - Geology and Topography

1. The Mineral Industry of North Carolina (USDI)
2. Geology and Mineral Resources of North Carolina (Ed. Series #3)
3. An Introduction to the Topography, Geology and Mineral Resources of North Carolina / Broadhurst (Ed. Series # 3)
4. Map: Generalized Geologic Map of North Carolina
5. Atlas of North Carolina p. 6-8
6. Modern Earth Science /Ramsey -- rocks p. 186-204; geologic time p. 384-405; p. 135; p. 150-185; p. 312-315; p. 475-477; p. 294-296
7. Stories Read From Rock /Parker

SUPPLEMENT # 9

"The Earth in Change: The Earth's Crust"

This film tells of the changing land features of the earth, and how wind, water, and ice wear away the surface. Sedimentation, volcanoes, and earthquakes are other forces which shape our planet. The film also illustrates that change does take place continuously in and on the earth.

Purpose of the film: To show that the surface of the earth is constantly changing as a result of certain forces.

SUPPLEMENT #10

The Geographical History of the State: Teacher Information

Questions for the students -- these may be placed on the board or overhead.

Note the model for the student answer sheet.

1. Read pages 5-20 in: AN INTRODUCTION TO THE TOPOGRAPHY, GEOLOGY, AND MINERAL RESOURCES OF NORTH CAROLINA by Broadhurst S342

2. What are the four main geologic eras?

3. Which main geologic era do each of the following belong to:
   a. Volcanic Slate Series of the Carolina Slate belt
   b. Carboniferous period
   c. Triassic period
   d. Cretaceous period

4. Why should you have a general knowledge of the geology of our state?

** Explanation of chart on student worksheet:

Column I - During which geologic era or period were the rocks of the coastal plains, piedmont, and mountains formed?

Column II - What is the geologic classification of the rocks of the coastal plains, piedmont, and mountains?

Column III - What are the four principle rock types found in each of the three divisions?

Column IV - How are each of the following (1-3) formed? Answer questions (4-5).
(1) igneous rock
(2) metamorphic
(3) sedimentary
(4) Why is sedimentary rock found in the coastal plains?
(5) Why is igneous, metamorphic and sedimentary rock found in the piedmont and mountains?

Column V - How old are the rocks of the coastal plains, piedmont, and mountains?

Column VI - What are the three principle commercial products from each of the three divisions and what are the products used for?

Additional Questions:

5. What is one unique thing about the rocks of the coastal plains?

6. How are coastlines formed?

Supplement # 10 (Cont.)

7. How do streams or rivers develop?

8. a. Has North Carolina experienced any volcanic activity? (Yes, No)
   b. If so, in which topographic division(s)?
   c. How is it known that volcanic activity has been present in these areas?
   d. How is a volcano formed?

Extra Credit:

9. When was the first state-sponsored geological survey?

10. How are the following formed?
   a. folded mountains
   b. fault mountains
   c. dome mountains

SUPPLEMENT # 11

Student Worksheet

*Students are to make a copy of this worksheet.

1. Reading notes (Reference #1)

2. Four main geological eras (References #1, #3, #4)

3. (References #1, #3, #4)
   a.
   b.
   c.
   d.

4. (Reference #4)

CHART: I	II	III	IV
Geologic era or period rocks formed in	Geologic classification of the rocks (igneous, sedimentary, metamorphic, all three)	4 principle rock types found in each division	How are each of these formed?
A. Coastal plains _____ era _____ era	A. Coastal plains _____ _____	A. Coastal plains 1._____ 2._____ 3._____ 4._____	A. Igneous
B. Piedmont _____ era _____ era _____ era	B. Piedmont _____ _____	B. Piedmont 1._____ 2._____ 3._____ 4._____	B. Metamorphic
C. Mountains _____ era _____ era _____ era	C. Mountains _____ _____	C. Mountains 1._____ 2._____ 3._____ 4._____	C. Sedimentary D. Why is sedimentary rock found in the coastal plains? E. Why is igneous, metamorphic, and sedimentary rock found in the mountains and piedmont?
References: #1 p. 6-8 #2 #3 p. 6-8 #4 p. 6-8	References: #1, #5, #6, #7, #18	References: #1, #5, #6, #7, #18	References: #1, #5, #6, #7, #18

CHART (Cont.)

V	VI
Age of the rocks	3 principle commercial products from the rocks and a use for each
A. Coastal plains _____ MYA B. Piedmont _____ MYA C. Mountains _____ MYA References: #1, #5, #6, #7, #18	A. Coastal plains rock use 1._____ 2._____ 3._____ B. Piedmont rock use 1._____ 2._____ 3._____ C. Mountains rock use 1._____ 2._____ 3._____ References: #1, #5, #6, #7, #18

Additional questions:

1. What is one unique thing about the rocks of the coastal plains?

2. How are coastlines formed?

Additional questions (Cont.)

3. How do streams or rivers develop? (Reference #18)

4. a. Has North Carolina experienced any volcanic activity? (Yes, No) (Reference #1)
   b. If so, in which topographic division(s)?
   c. How is it known that volvanic activity has been present in these areas?
   d. How is a volcano formed?

Extra Credit:

5. When was the first state-sponsored geological survey? (Reference #1)

6. How are the following formed?

   a. folded mountains
   b. fault mountains
   c. dome mountains

SUPPLEMENT # 12

Key to Student Worksheet

1. Notes

2. Precambrian, Paleozoic, Mesozoic, Cenozoic (Tertiary and Quaternary)

3. (A) Paleozoic (B) Paleozoic (C) Mesozoic (D) Mesozoic

4. A general knowledge of the geology of North Carolina will yield a better understanding of the state's natural resources and consequently better utilization.

**Chart:

Column I:
A. Coastal plains: Mesozoic era (Cretaceous period)
Cenozoic era (Tertiary and Quaternary periods)

B. Piedmont: Precambrian era
Paleozoic era (Carboniferous age and Volcanic Slate Series)
Mesozoic era (Triassic age)

C. Mountains: Precambrian era
Cambrian era
Paleozoic era

Column II:
A. Coastal plains: sedimentary (really all three rock types); point out why coastal plains rock is considered just sedimentary--sedimentary rock is the youngest rock in terms of geologic formation.

B. Piedmont: all three rock types

C. Mountains: all three rock types

Column III:
A. Coastal plains: sand, gravel, clay, marl

B. Piedmont: sandstone, shale, granite, diorite, schist

C. Mountains: granite, diorite, quartz, slate, limestone, gneiss, schist

Column IV:
A. igneous -- cooling and crystallization of molten magma

B. metamorphic -- rocks heated or pressed together under high pressure for long periods of time

C. sedimentary -- rocks formed in layers from materials deposited by water (ocean), wind, ice

Supplement # 12 (Cont.)

D. It is the youngest! Coastal plains was once covered by the ocean.

E. At one time parts were covered by water, ice, and other weathering processes such as wind action. Volcanic activity prevalent -- cooling and crystallizing of metamorphic rock yields igneous rock.

Column V:

A. Coastal plains: 125 to 70 MYA

B. Piedmont: 3,000 to 180 MYA

C. Mountains: 3,000 to 230 MYA

Column VI:

A. Coastal plains: marl, sand, gravel --- construction

B. Piedmont: shale and sandstone ---- manufacture of brick and tile
granite and diorite ---- construction and agricultural purposes
metamorphic (clay, stone, slate) ---- agricultural

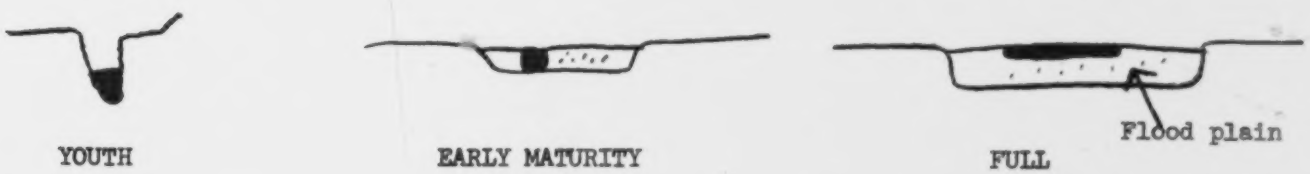
C. Mountains: granite and diorite ---- road base, concrete paving
slate and limestone ---- construction and agricultural
metamorphic rock ---- agricultural

Additional Questions:

5. They are the youngest!

6. Changes in water level determine basic shape -- waves and current cut away the land

7. Stages:
   1. Youth (steep land) V cut
   2. Early maturity (slope not steep, water movement slow, begins to wind (meander)
   3. Full maturity (land almost level, oxbow lakes, flood plains)



YOUTH EARLY MATURITY FULL

8. a. Yes
   b. Piedmont and mountains
   c. Rocks are badly twisted, folded, sheared, and highly altered as a result of much heat and pressure
   d. Formed when molten rock and gas erupt from deep inside the earth. Large amounts of earth and rock are pushed up under great pressure, thus forming a mountain.

Supplement #12 (Cont.)

9. 1821

10. a. Folded - result of wrinkling or folding of the earth's crust in a series of long ridges and valleys

b. Fault - break in the earth's crust where land on one side has slipped in relation to land on the other side

c. Dome - formed as a result of an upward thrust of rock deep under the surface of the earth

SUPPLEMENT # 13

Bibliography to Activity*

UNIT II: Geographical History of North Carolina

1. Broadhurst, AN INTRODUCTION TO THE TOPOGRAPHY, GEOLOGY, MINERAL RESOURCES OF NORTH CAROLINA North Carolina Department of Conservation and Development, (p. 5-11)

2. North Carolina Department of Natural and Economic Resources, GENERALIZED GEOLOGIC MAP OF NORTH CAROLINA

3. The University of North Carolina Press, ATLAS OF NORTH CAROLINA (p. 6-8)

4. Stuckley, GEOLOGY AND MINERAL RESOURCES OF NORTH CAROLINA North Carolina Department of Conservation and Development, (p. 3-8)

5. Ramsey, MODERN EARTH SCIENCE Holt, Rinehart & Winston, (p. 372; p. 387-403)

6. Page, THE EARTH AND ITS STORY American Education Publications (Igneous rocks p. 6-8; Sedimentary rocks p. 14-15; Metamorphic rocks p. 16-18, p. 22)

7. Welch, AN INTRODUCTION TO SOIL SCIENCE IN THE SOUTHEAST The University of North Carolina Press (Igneous, Sedimentary, Metamorphic rocks p. 10-11)

8. Shepherd, WEALTH FROM THE GROUND Golden Press

9. Parker, STORIES READ FROM ROCKS Harper and Row

10. Bishop, FOCUS ON EARTH SCIENCE Charles E. Merrill Publishing Co. (Geologists and Geology p. 5-6; Geologic time p. 370-385, p. 391-411)

11. Rich, SOIL CLAY MINEROLOGY The University of North Carolina Press

12. Kelly, OUR ROCKS RICHES Speaker-Hines & Thomas, Inc:

13. Mattison, MAN AND HIS RESOURCES Creative Educational Society, Inc.

14. U. S. Dept. of the Interior, USE AND CONSERVATION OF MINERALS

15. Jacobs, THE SHAPES OF OUR LAND G.P. Putnam's Sons

16. Emmons, GEOLOGY: PRINCIPLES AND PROCESSES McGraw-Hill Book Co.

17. U. S. Dept. of the Interior, GPO, GEOLOGIC TIME

*References #1 - #18 referred to throughout Unit II.

SUPPLEMENT # 13 (Cont.)

18. INDEPENDENT STUDY PRINTS - GEOLOGY: LANDFORMS AND PHYSICAL FEATURES; MINERALS AND THEIR PROPERTIES Hubbard Scientific Company

19. Film: "The Earth In Change: The Earth's Crust", Encyclopedia Britannica

POST-ACTIVITY PLANS

UNIT II: GEOGRAPHICAL HISTORY OF NORTH CAROLINA

TIME: 3 - 4 periods

I. Field Study

A. Preparation for field study - 1 period

B. Field Study - 1 day (8:00-4:00) (36 students)

Student data sheet (Supplement #14)

C. Discussion relating to observations made on field study and interpretation of data collected - 1 period

D. Quiz - 1 period (Supplement #16)

NOTE: Attached sheets give detailed directions

Supplements:

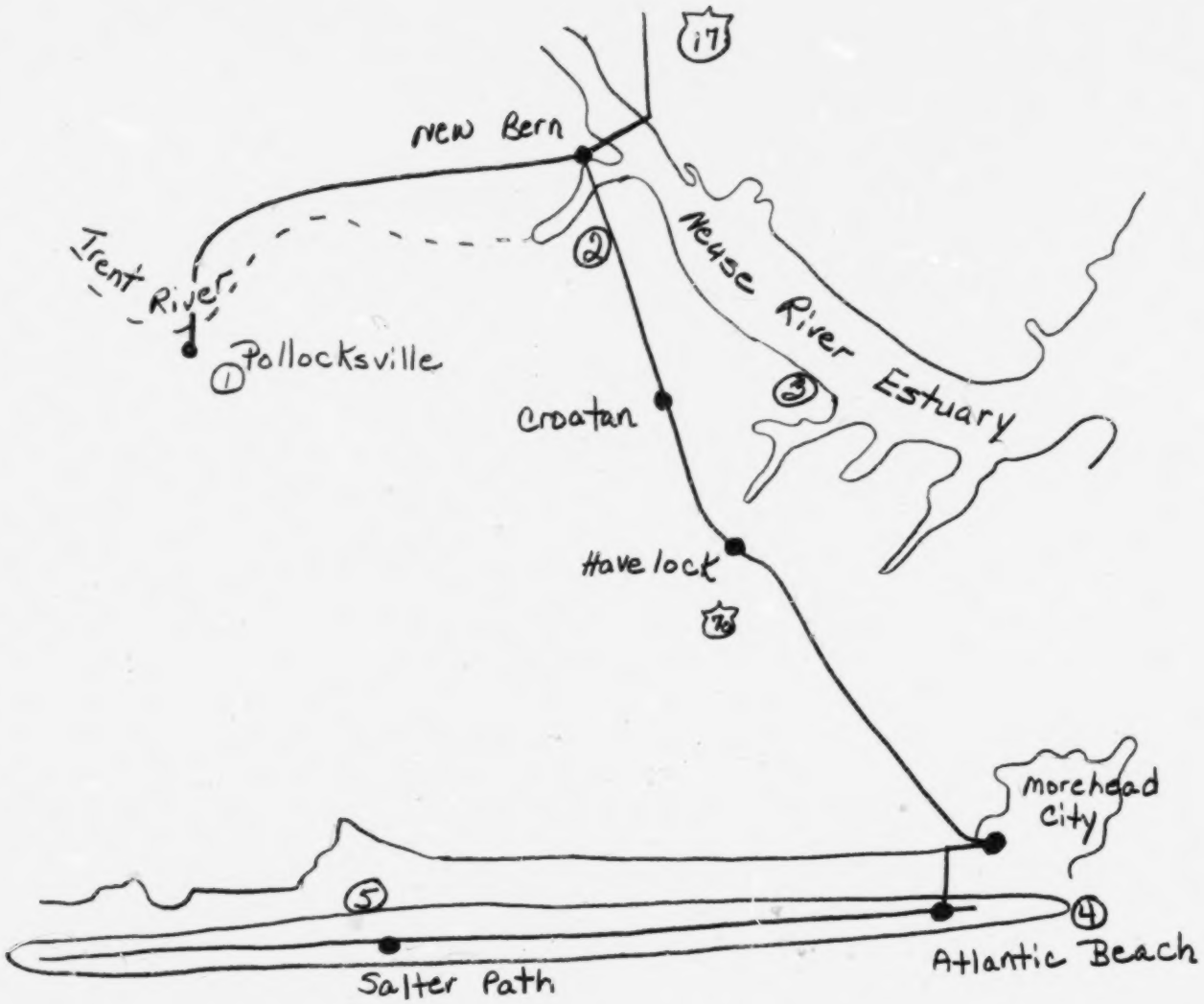
#14 Geological Field Study: Student Worksheet

#15 Schedule

SUPPLEMENT #14

Geological Field Study: Student Worksheet

NAME_____ PERIOD_____ DATE_____



Map shows geological sites which are to be included in field study

INTRODUCTION

During this field study you will observe geologic change (past and present). By observing such changes, which have taken thousands of years to occur, I hope you will realize that these events (past and present) determined what natural resources are present in our state, and are also still shaping, affecting, and determining our natural resources today.

I. SITE #1 Oyster Reef South of Railroad Station in Pollocksville

Pollocksville Railroad Station Site

Location - Jones County; in Pollocksville on the east side of the railroad about 500 feet south of the railroad station.
Just after bridge turn east off U. S. Highway 17 left at the American Station onto the first street. This is a very inconspicuous street and easily missed. Cross the railroad and park at the railroad station. Follow the railroad track north across the river. Look at north bank at railroad bridge.

THINGS TO DO:

1. Look carefully at the north banks at the end of the railroad bridge near the water level. Record what you see embedded in the river banks. _____

_____

2. Why were oysters once present in the Trent River at this location? _____

_____

3. Why are the oysters no longer present? _____

_____

4. Take a sample of the bottom sediment. Place it in a plastic bag.
   a. Briefly describe the sediment. _____

   _____

   b. Why do you think oysters cannot live in this sediment today? _____

   _____

   c. What was the bottom like when the oysters were living in it? _____

   _____

   d. In class, look at the sediment sample under the microscope. Record observations. _____

   e. Check the salinity (salt content) of the water. Record amount (use test kit). Amount of salt present _____

f. What change or changes occurred so that the river's environment was changed so that oysters could no longer survive?_____

_____
(State at least one change)

GEOLOGIC FEATURES:

1. Oyster reefs or banks embedded in an orange-brown fine sand

2. During Eocene Castle Hayne time, oysters were living in patches on sand bottom. As the oysters died, the shells accumulated and more sand was deposited between the shell banks, until present banks were formed.

II. SITE #2 Brinson Memorial School Site

Location:

Craven County on the south bank of the Neuse River Estuary, about 3 miles southeast of New Bern. Brinson Memorial School is located on the old New Bern Cherry Point (old U. S. 70) Road. Numerous county roads (county road 1124) lead from U. S. 70 to the old New Bern Road. Turn left from U. S. 70 onto road 1124. Follow the old New Bern Road to Brinson School. On the west side of Brinson School turn right on County Road 1125. Park behind the school in the open area. Walk to the north end of the old dirt road, and then walk directly to the banks of the Neuse River Estuary through the cleared path. Walk left (west) along the beach to the grassy point through which a small creek flows. Across this point can be seen the south bank of the Neuse River.

THINGS TO DO:

1. Start at the bottom unit in the area. Locate, describe, and discuss each unit in the area. (For best observation it will probably be necessary to use a shovel and clean off a strip about one foot wide from the top to the bottom of the exposure.)

UNIT	DESCRIPTION
a. Bottom unit (James City Formation)	_____
	_____
	_____
b. Second unit or middle unit	_____
	_____
	_____
c. Top unit (Flanners Beach Formation)	_____
	_____
	_____

2. Trace or follow the upper part of the James City Formation (marked by brownish-red iron oxide) as far as possible to the southeast (about 200-300 yards). Note and try to explain any lateral changes in it. _____

_____

3. At the southeastern end of this series of exposures, note the modern sediments being deposited. Why is the sediment being deposited in this area? _____

_____

4. On the small beach note the fine to-medium quartz sand. The black grains are grains of the mineral ilmenite. You may take a small sample to look at under the microscope.

GEOLOGIC FEATURES:

UNIT SURFACES (from top to bottom)	THICKNESS	DESCRIPTION
Flanners Beach Formation 3	10 ft.	Composed mainly of mottled gray-orange sandy silt with some thin layers of white silty, very fine sand, some plastic clay layers.
2	6 ft.	Light olive gray, clayey, silty, very fine sand with some thin layers of white very fine sand and some layers of plastic clay.
James City Formation 1	5 ft.	A light brownish-gray, fossiliferous silty, very fine sand; fossils abundant; upper part of this unit often brownish-red because of deposition of iron oxide.

ORIGIN AND AGE

Botton unit (#1) of James City Formation - probable Pliocene Age (about 1 million years old) - Types of fossils indicate that it was deposited in a salty sound or bay at a depth of 40 to 50 feet below sea level. Bottom waters must have been fairly still as is indicated by the muddy sediments and the unbroken and undisturbed nature of the shells. After the deposition of the James City Formation, the land rose or sea level dropped so that the top of the formation was exposed to weathering and erosion. Perhaps iron oxide concentrations were formed at this time. Units #2 and #3 are of the Pleistocene Flanners Beach Formation (50,000 - 100,000 years old). To the southeast about 6 miles, this formation contains numerous marine shells. At this site no marine fossils are found.

III. SITE # 3 Neuse River Recreation Area Site

Location:

Craven County - on the south bank of Neuse River Estuary about 9 miles southeast of New Bern, about 7 miles northwest of Havelock. Follow U. S. 70 to county road 1107, which is 0.3 mile southeast of Croatan. Follow road 1107 to the recreation area. Walk down the flight of stairs to the beach and then walk to the right (southeast) for 550 feet (about 200 steps) and then look back to see the view.

THINGS TO DO:

1. Start in bottom unit in the area. Locate and describe each unit. Use a shovel and clean off a strip about a foot wide from top to bottom of exposure, if necessary.

	UNIT	DESCRIPTION
a.	bottom unit	_____
		_____
		_____
b.	second unit	_____
		_____
		_____
c.	third unit	_____
		_____
		_____
d.	fourth or top unit	_____
		_____
		_____

2. Note the sands now accumulating on the beach. Pick up a handful. Describe the grains of sand, (small, medium, large) _____. These are the rocks of the future. Off-shore sediments are finer-grained.

3. Why are cypress stumps present but no cypress trees? _____

_____

4. When were these different units formed?_____

_____

5. Why do you find different types of sediments and fossils in this area?_____

_____

GEOLOGIC FEATURES

UNIT SURFACES (from top to bottom)	THICKNESS	DESCRIPTION
4	5 ft.	Light tan, silty, very fine sand
3	8 ft.	Interbedded light, tannish-gray, sandy clay and light orangish-gray, silty very fine sand.
2	7 ft.	Olive-drab shell bed; shells embedded in sandy clays or clayey sands; large pelecypods found in lower $\frac{1}{2}$ unit; rest of unit characterized by abundant small mollusks; upper part frequently weathers to a dull rust-brown (iron oxide) and has some of the shells dissolved away leaving imprints or molds.
1	3 ft.	Purplish-black, clayey, silty fine sands with fossil cypress stumps.

ORIGIN AND AGE:

--All units belong to the Flanners Beach Formation of Pleistocene Age (50,000 - 100,000 years old).

--The types of sediments and fossils found vary because of differences in the sedimentary environment; salty water to brackish to fresh shallow to not-so-shallow water.

--The sediments and fossils exposed here can be interpreted to indicate an advance and retreat of the sea. The bottom unit (#1) with cypress stumps is obviously of fresh water origin. A rising sea flooded and killed the cypress trees. Large pelecypods lived in the shallow marine waters (bottom of unit #2). As water became deeper, black organic muds with small mollusks accumulated (upper part unit #2); sea receded and waters over the area became shallow (unit #3 and #4).

IV. SITE #4 Fort Macon State Park Locality

Location:

Carteret County - the beach just east of the easternmost building at the swimming area of Fort Macon State Park. At the stop light in the middle of the town of Atlantic Beach, turn east (left) on county road 1190. Turn right to the swimming area just inside the boundary of the park. Park at the easternmost side of the parking area and walk to the beach around the left side of the easternmost building. At the water's edge look east at the view.

GEOLOGIC FEATURES AND THINGS TO DO:

1. Bring a handful of clayey sediment or soil with you and place it in the edge of the water. (Keep the sediment in your hand). What does the wave action do to the sediment?_____

_____

Where do you think the finer sediment which the waves removed is deposited?

_____

2. Take a sample of sediment from the foreshore and also from the backshore. Examine the nature of the beach sediments with a hand lens in class. Most of the sediment is fine quartz sand with varying amounts of the black, heavy mineral ilmenite. Sediment collected where the waves or surf breaks is a little coarser, usually with abundant shell fragments. Draw your observation. (As follows:)

   a. Sediment collected where — Draving

   b. Other beach sediment

3. Dig a small trench about 6 inches deep in the beach sand and note the rather typical bedding or lineation of the beach sediments.

4. Observe small ripple marks in very shallow water. Draw your observation.

5. Wind blowing over sand surface produces current ripple marks. Observe these on drier sands of backshore and sand dunes.

6. Berm: observe such an area - (in middle of the beach dividing beach into backshore and foreshore). The surf and swash bring in sands and build a berm at normal high tides level. Berms are transitory features. Draw your observation.

7. Observe the sea cliff landward of the backshore. This sea cliff is cut during times of storms when water level is higher and wave and surf action reaches further landward.

8. Go to the top of the sea cliff and look northward toward the oil tank at Morehead City. Observe the sand dunes, Bogue Sound, and the marsh.

   a. Observe the drifting sand dunes. This sand was blown from the drier portions of the beach during times of strong landward winds. Why are the sand dunes moving? _____

   _____

   b. Examine the sediment of the sand dunes. Note the general similarity to the beach sands. Large shell fragments are missing. Why is there a similarity between beach sediment and sand dune sediment? _____

   _____

   c. Wind-action has also eroded certain spots in the sand dune to form depressions called blow-outs. In the walls of these you can observe the dune bedding, which typically has a much steeper angle than beach bedding. Why does the bedding grow at a steeper angle in the depression? _____

   _____

   d. Look toward Morehead City and observe the marsh area on landward side of the island. Sediments here are black sandy muds.

e. From this point can be seen the features typical of shorelines along regions with flat coastal plains landward of the shore. Probably 10,000 years ago sea level was lower and this island was not in existence. Sea level rose as a result of melting of great polar ice caps and became somewhat stationary about 4,000 years ago. Breaking waves stirred up the sediments just off-shore and built this island, a barrier or off-shore island, leaving a body of water (Bogue Sound) between the barrier island and the mainland. To the east can be seen Beaufort Inlet that separates Bogue Banks (this island) from Shackleford Banks.

9. In and around the parking area can be seen a lot of crushed stone. This came from the Eocene Castle Hayne limestone, either at Belgrade or New Bern.

V. SITE #5 Emerald Isle Site

Location:

Carteret County - about 1½ miles west of Salter Path - county road 1201 leads from Atlantic Beach to Salter Path. On county road 1201 and 1.05 miles west of the junction with road 1192 (just west of Salter Path) can be seen a hurricane break-through (view is from top of sand dune just to the south of road). The hurricane break-through to be seen is just beyond (west) the A-frame house and just east of the house on left. Continue on .15 mile or (1.2 miles) from the 1201-1192 junction for parking. This site is in the center of the break-through.

GEOLOGICAL FEATURES:

During hurricane Hazel in 1954 strong offshore winds and high tides resulted in a lot of water being pushed into Bogue Sound. When the storm passed, the offshore water level fell rapidly while the water in the sound could only be released through inlets. The water in the sound was perhaps 5 to 10 feet higher than in the ocean. This resulted in tremendous forces being placed on the barrier bar. Any narrow and low place on the bar was subject to being rushed over by the high waters in the sound. This locality is such a place, and the waters did rush through here from the sound to the ocean. A new inlet was created. Scars of the old channel-way can be seen cutting diagonally across the bar from the northwest to the southwest. The inlet was not too deep. After the storm, the inlet was partially clogged by sediment, and bulldozers finished closing it.

a. Why was this site selected for you to observe?_____

_____

_____

SUPPLEMENT # 15

Geologic Field Study: Teacher Preparation

I. Schedule:

	Leave	Arrive	Travel Time (bus)
1.	Washington 8:20 A.M.	New Bern 9:10 A.M.	50 min.
2.	New Bern 9:10 A.M.	Pollocksville 9:35 A.M.	25 min.
	(*Site #1 requires 30 min)		
3.	Pollocksville 10:05 A.M.	New Bern 10:30 A.M.	25 min.
4.	New Bern 10:30 A.M.	Brinson Memorial School 10:45 A.M.	15 min.
	(*Site #2 requires 20-30 min.)		

*Rest stop--sodas for lunch--service station just before forest entrance

5.	Brinson Memorial School 11:10 A.M.	Croatan National Forest 11:30 A.M.	15 min.
	Lunch at Croatan National Forest picnic facilities available 11:30-12:00		Observation of Site #3 12:00-12:20
	(*Site #3 requires 20-30 min.)		
6.	Croatan National Forest 12:30 P.M.	Fort Macon 1:10 P.M.	40-50 min.
	(*Site #4 requires 40 min.)		
7.	Fort Macon 2:00 P.M.	Emeral Isle 2:20 P.M.	20 min.

*Rest stop - gas, refreshments -- Texaco Station at Morehead (*Site #5 requires 15 min.)

8.	Emeral Isle 2:30 P.M.	Washington 4:00 P.M.	1½ hours.

II. Permission to visit Croatan National Forest can be obtained by writing:

District Ranger
Croatan National Forest
Box 3335
New Bern, N. C. 28561

Supplement #15 (Cont.)

III. Refer to the Teacher Information Sheet. Additional information is given below:

A. Objective: For students to observe geologic change (past and present). By observing such changes, which have taken thousands of years to occur, students should realize that these events (past and present) determined what natural resources are present in our state, and are also still shaping, affecting, and determining our natural resources.

B. Much of this information was obtained from a field guide prepared by the North Carolina Department of Public Instruction and Curriculum Study and Research. The publication was not dated. The materials included in this revised version are very valuable!

C. Thirty-six is a very workable number for this field study.

D. Caution the students about being on the sand dunes at Fort Macon Recreation Area. The dunes have been seeded with vegetation in an attempt to stabilize them. The park service does not wish to have students sliding or walking on the dunes. There is no sign or ranger on duty to inform you not to venture onto the dunes! It might be a good idea to write, informing the Park Ranger of your group's visit (when and approximate time) and also inquire about the dunes.

E. It is a good idea to mimeograph field study schedule for student use. This can also serve as a permission slip and students can also write on the bottom things needed for the field study.

Things needed for the trip:

1. Bag lunch - no bottles allowed on the bus
2. Suggest that students wear sneakers and dungarees
3. Pencil, worksheet, hard surface to write on (cardboard or clipboard)
4. Plastic bag (2)
5. Can (vegetable or soup can)
6. Salinity Test Kit practice using before the field study
7. A spade or digging tool (old spoon)
8. A bag (about $\frac{1}{2}$ cup) of clay or soil

F. Note - Field Study Worksheet

Site #4, Question #2: Have students take a sample of sediment from the foreshore and backshore. Observations will be made in class.

Site #5: Students remain on the bus.

Supplement # 15 (Cont.)

G. Notes to give students before the field study:

1. Review the field study worksheet. Go over the things the students are to do on the trip.

2. Notes to give the students:

a. A berm is located between the foreshore and the backshore. The foreshore is the one next to the ocean. A berm is actually a ridge of sand which is formed when the surf and tides bring in sand and deposit it. Berms are transitory features and are destroyed by storms.

b. A sea cliff is landward of the backshore.

c. On the sand dunes note the depressions called "blow-outs". These are evidence of erosion.

d. Note the features typical of shorelines· sand dunes, sounds, marshes.

STENCIL

SUPPLEMENT # 16

QUIZ: Geology

Directions: Complete as thoroughly as possible the following questions.

1. What is the youngest geologic era?

2. Why did we visit the Pollocksville site? (Be specific)

3. Briefly tell about another geologic site we visited and why it was considered important to see.

4. List the four main geologic eras from oldest to the youngest.

THE CONSERVATION OF NORTH CAROLINA'S NATURAL RESOURCES

UNIT III: Salt Water Marshes---One Of North Carolina's Most Valuable and Vulnerable Resources

Pre-Activity (Parts I and II)	9½ periods
Preparation for Field Study (Activity)	2 periods
Filler	1 period
Field Study (Activity)	2 periods
Post-Activity	3 periods
	16½ or 17½ periods

Films:

Pre-Activity:

1. "Estuarine Heritage" 25 minutes Free
   (Wildlife Resource Commission)
   Schedule dates _____ or _____
2. "Life Along the Waterway" 11 minutes Free
   (Encyclopedia Britannica)
   Schedule dates _____ or _____
3. "Seashore Life" 10 minutes Rental: $2.00
   (University of North Carolina)
   Schedule dates _____ or _____
4. "Wildlife Babies" 25 minutes Free
   (Wildlife Resource Commission)
   Schedule dates _____ or _____
5. "Cry of the Marsh" 17 minutes Free
   (Wildlife Resource Commission)
   Schedule dates _____ or _____
6. "Marshland Is Not Wasteland" 17 minutes Free
   (Wildlife Resource Commission)
   Schedule dates _____ or _____

TO THE TEACHER

Teacher Supplements - Unit III

Pre-Activity

#17 ESTUARIES: CRADLES OF LIFE. Can be obtained from United States Department of The Interior, (Washington, D. C.) Bureau of Sport Fisheries and Wildlife

#18 A Field Study of a Salt Water Marsh

#19 Questions for the Film "Life Along the Waterway"

#20 Bibliography to Pre-Activity and Activity

#21 North Carolina's Coastal Zone Management Programs

#22 Pre-test and Key

#23 Teacher References

Activity

#24 Salt Marsh Field Study

#25 Teacher Reference for Transect Study

#26 Teacher Reference: Zonation of Plants and Animals in a Salt Marsh

#27 Schedule for Field Study

#28 Student Guide for Field Study

COURSE: CONSERVATION OF NORTH CAROLINA'S NATURAL RESOURCES

UNIT III PLAN

UNIT III TITLE: Salt Water Marshes--One of North Carolina's Most Valuable and Vulnerable Resources

TIME: $16\frac{1}{2}$ - $17\frac{1}{2}$ periods

PURPOSE OR OBJECTIVE:

For the students to understand that a salt marsh is a viable area of natural resources, and that man can have an affect on this fragile ecosystem.

ABSTRACT:

This unit involves a generalized study of a salt marsh. Using the marsh as the instrument, awareness of the natural resources within the environment and the role these resources play in the balance of nature may be developed. The students research certain key questions and then meet as a group to discuss their findings. Also included within the unit is a field study of a salt marsh. The field study allows the student the opportunity to experience the environment of a marsh, and subsequently the student will be able to formulate his own opinions concerning the ecological and economical value of salt marshes.

PRE-ACTIVITY PLANS (PART I)

UNIT III: SALT WATER MARSHES--ONE OF NORTH CAROLINA'S MOST VALUABLE AND VULNERABLE RESOURCES

TIME: $9\frac{1}{2}$ **periods** (Total time Parts I and II) TIME: 1 period (Part I only)

LECTURE

I. Introduction - general introduction to natural resources

A. Natural resources

1. Definition of natural resources

2. Points to emphasize

a. Examples of natural resources in the state
b. Dependency on natural resources
c. Renewable as opposed to non-renewable natural resources

B. Conservation of natural resources

1. Definition of conservation - managing resources considering the total environment and well-being of man

2. Discussion (suggested topic - Need for Conservation Action Today)

3. Change in the environment (affect of natural and man-made)

C. Ecological Approach to North Carolina's natural resources

1. Points to emphasize

a. Interdependence and interrelationship of biotic and abiotic factors
b. Interdependence and interrelationship of all resources
c. Need for acquiring general knowledge of how all environmental factors function as a whole
d. North Carolina - an ecosystem
e. Man - a part of an ecosystem

2. Five ecological principles

a. Balance of nature (interrelationships and interdependence of all things - biotic and abiotic)
b. Dependence of all life on natural resources
c. Green plants (food source)
d. Limiting conditions for all living matter
e. Community - total relationship of living things (plants and animals)

UNIT III: Salt Water Marshes--One of North Carolina's Most Valuable and Vulnerable Resources (Cont.)

3. Conservation of Natural Resources

a. Definition of conservation - management, including either preservation or use, of our natural resources for the well-being of man, taking the total environment into account.

b. Change within the environment - natural and man-made

D. Handout - ESTUARIES CRADLES OF LIFE (Note Supplement # 17)

TIME: 1 period

REFERENCES:

A. OUR NATURAL RESOURCES by Kircher (S323)

B. MAN AND HIS RESOURCES by Mattison (p. 9-19) (S317)

C. ESTUARIES: CRADLES OF LIFE (Suggested Student Handout - Note Supplement #17)

PRE-ACTIVITY PLANS (Part II)

UNIT III: SALT WATER MARSHES--ONE OF NORTH CAROLINA'S MOST VALUABLE AND VULNERABLE RESOURCES

Time: 8½ periods (Part II only)

I. Unit objective and suggested teaching schedule

A. Objective (refer to introduction)

B. Suggested schedule

1. Reading and discussion
2. Pre-test
3. Field Study
4. Discussion
5. Post-test

II. Introduction to salt marshes

A. Discussion to reveal student knowledge

B. Points to emphasize

1. Location in North Carolina
2. Classification of salt marshes as natural resources
3. Definition of salt marshes
4. Affect of salt marshes on man's life (survival); suggested film "Estuarine Heritage" 25 minutes (Wildlife Resource Commission)

III. Suggested student reference

A. A Field Study of a Salt Water Marsh
(Student Handout - Note Supplement #18)

B. "Marsh Ecology" 6 minutes - slide tape
(obtain from Gull Lake 1208)

IV. Concluding discussion and review of material covered

TIME: 2 periods

V. Discussion

A. Suggested topic - Variety of Life Along A Waterway (interdependence and interrelationships of the whole)

B. Suggested film - "Life Along the Waterway" 11 minutes

1. Questions for film (Note Supplement # 19)
2. Discussion of film and questions

TIME: 1 period

UNIT III: Salt Water Marshes--One of North Carolina's Most Valuable and Vulnerable Resources Part II (Cont.)

VI. Panel discussion of Supplement # 18 (A Field Study of Salt Water Marshes)

A. Suggested approach

1. Select panel to act as experts (select prior to class time)
2. Questioning by remaining students

B. Summary of panel discussion

TIME: 1 period

VII. Student research

A. Topics for student research

1. Defining what a marsh is
2. Determining all factors that depend on a marsh
3. Determining how man affects or changes marshes
4. Describing ecological relationships that exist within a marsh

B. Suggested student references (Note Supplement # 20 - Bibliography)

1. Cassette tapes
   a. "Echoes from Davey Jones Locker"
   b. "The Salt in Our Blood"

2. Films (Note Supplement # 20)
   a. "Seashore Life"
   b. "Wildlife Babies"

3. Bibliography (Note Supplement # 20)

4. North Carolina's Coastal Zone Management Programs (optional) (Note Supplement # 21)

TIME: 4 periods

VIII. Pre-test (Note Supplement # 22 and # 23)

TIME: ½ period

A FIELD STUDY OF A SALT WATER MARSH
(SUPPLEMENT # 18)

SALT WATER MARSHES -- ONE OF NORTH CAROLINA'S MOST VALUABLE AND VULNERABLE RESOURCES

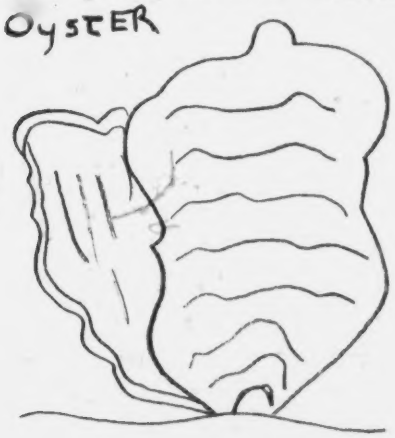
I. Introduction

One of the most fascinating wildlife areas on earth is a marsh. It is one of North Carolina's and the nation's most valuable natural resources. A salt marsh is a coastal area which is regularly flooded by the tides. It is the grassy area seen between the mainland and the ocean. However, a marsh is more than just a grassy area. It is a grassy area teeming with a variety and abundance of some of the strangest and most fascinating plant and animal life. It is the home for many wildlife; provides protection for some; a breeding area for a large majority of organisms, and serves as a source of food for others.

On a visit to a salt marsh one may see at first glance only tall cordgrass gently swaying in the breeze, but on closer inspection one may be startled by the scurrying of the fiddler crab or hear the rustling of the cordgrass as some of the marsh birds are disturbed. From the water one may discover oysters, clams, and many unusual and interesting shells. A look out over the marsh reveals that differences in color and type exist even among the plants or "grasses".

Geologically marshes are very old. It was in this area that the first land plants and animals developed. The salt marsh is one of the last unspoiled areas on our planet.

When an ecologist looks upon and explores a marsh he sees living and non-living things depending, relating to, and interacting with each other directly and indirectly. A system in which living and non-living exchange materials is an ecosystem. A salt marsh is a distinct ecosystem which has a vital function in maintaining our environment. Most people, unlike the ecologist, look upon a marsh as "wasteland". Don't be deceived by the marshes appearance.



Even though that smelly, muddy tract of land may seem to just be a waste, it is not, it's a valuable part of our environment (or the universal ecosystem). Be an ecologist and recognize that a marsh is one of our greatest natural resources. Even the components of the marsh - the wildlife, fishes, the water, the air - all are natural resources vital to our survival.

Yet marshes are being destroyed at an alarming rate. The four main dangers to marshes are: (1) pollution (2) dredging, filling, and draining (3) over-harvesting of the marsh resources (4) general human encroachment by buildings, bridges, marinas, boats, chemicals.

Are we going to allow the total destruction of such a valuable resource in North Carolina? Are we going to allow the areas which help feed the oceans, stock the flyways, store water, prevent flooding, and provide recreation for us to be depleted?

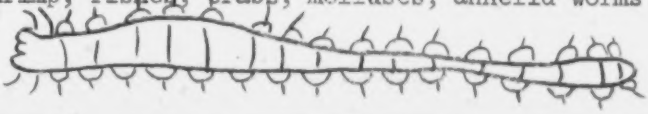
What can you do to protect the marshes in North Carolina? First, you must learn as much as you can about marshes so you'll know why these areas must be preserved (that's what we'll be doing the next few weeks). Second, do you know what is being doing in North Carolina to alert the public to the economic value of marshlands? Is anything being done? Next, is North Carolina taking any steps to acquire and preserve some of the marshes?

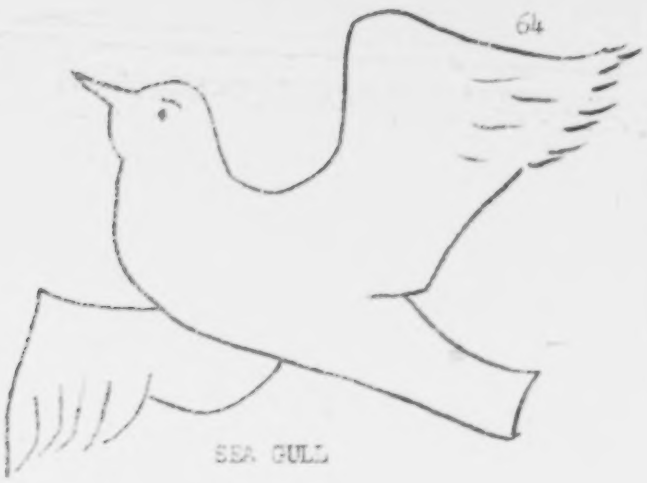
Yes, there's a lot one needs to know. Yet learning about such a valuable resource to you and I can be so exciting! Remember, environmentalists (you and I) must be able to explain and defend our viewpoint concerning marshes. We must lay down a concrete foundation of knowledge so that when challenged we'll be able to meet the challenge. I'm ready. Are you ready to "actively" learn why a marshland is not a wasteland?

II. The Salt Water Marsh as an Ecosystem

Geological evidence indicates that salt marshes are thousands of years old. Tidal salt marshes are the result of land plants invading the shallow waters of the coastal areas. The most common boundary between sea and land is either a sandy beach, rocky shore, or salt marsh. The conditions in the salt marsh are not as harsh in many respects as those of the open beach. The quiet, protective waters of the salt marsh abound with a great number of species of shrimp, fishes, crabs, molluscs, annelid worms (segmented) and crustaceans.

ANNELID WORM ⟶





SEA GULL

The marsh is an example of an ecosystem in that it is an area which contains living organisms and non-living factors which interact. The boundaries of the salt marsh like ecosystems in general are not static (permanent). The fishes which inhabit the marsh during their juvenile stage spend their adult life hundreds of miles out in the ocean. Migratory birds may stop for brief periods and raccoons from a nearby pine forest may wander into the marsh during low tides in search of oysters and mussels. The ecosystem is not a self-contained unit, but instead, ecosystems tend to overlap.

The salt marshes are greatly influenced by being covered part of the time by saline (salty) or brackish water. Naturally this produces unique physical conditions. Some marsh plants can withstand being covered only part of the time while others can withstand being covered with water all of the time. In certain areas of the marsh where water may be trapped, salinity increases due to evaporation of the water. Yet river drainage and the accumulation of rain water tend to reduce the salinity of the salt marsh. The waters in and around the marsh are relatively shallow and are therefore subject to rather wide fluctuations in daily and seasonal temperatures. Not only marsh plants but marsh organisms must adapt to these differing environmental conditions.

BARNACLES

The typical marsh bottom is mud-sand, mostly mud. This tends to result in poor drainage and low oxygen availability. Many organisms found on the bottom are of the burrowing type. One example is the annelid worms which are sluggish and have low oxygen requirements. Two other organisms found on the muddy bottom are the fiddler crab and the marsh crab.

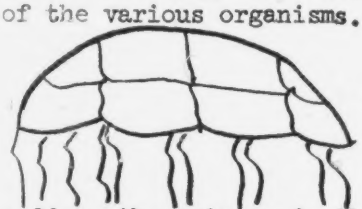
The fiddlers and the marsh crabs retreat to their burrows during high tides and wander about feeding during low tide. The whitish marsh periwinkle is an air-breather and cannot tolerate long periods of submersion (being under water). The blades of the salt marsh cordgrass are encrusted with various algae and planktonic forms during high tides and the periwinkle grazes on this accumulated material as it moves along the stalks of the cordgrass. The black mud snail, Nassarius, is usually common on the muddy floor of the salt marsh. This creature is small and brown. Various fishes are common in the salt marsh and the shallow waters surrounding the marsh.

SPONGE SEAWEED

The salt marsh is a nursery area for most commercial species in the Carolinas. All of the fishes of the salt marsh are small even though some will later become large in the sound or ocean.

Few organisms feed directly on the salt marsh cordgrass but when it dries and decays the nutrients are released into the surrounding waters and are ultimately used by mud algae and phytoplankton to construct complex organic compounds which are passed along the food chains. The waters around the marsh are shallow and nutrient-rich thus making them very productive in the sense of the amount of life they can support. The noted ecologist, Eugene Odum, found estuaries to be twenty times as productive as the open ocean and two times as productive as a corn field. The salt marsh is a nursery for many species of fish, crabs, shrimp, etc.. Food is plentiful and protection from enemies is easily found in the shallows and eel grass. In the tidal creeks, only a few species of fish are prominent but upwards of sixty species are usually represented by small numbers of individuals . As one moves up into a tidal creek, the species present change due to the decrease in salinity and corresponding tolerances of the various organisms.

PERIWINKLE SNAIL



JELLYFISH

III. Salt Marsh Conservation

According to the well-known ecologist, Eugene Odum, the estuary is the most naturally fertile area of the earth. In ecosystems, conditions of high fertility generally result in high productivity if other desirable factors are present and undesirable factors are absent. Primary productivity is high in the salt marsh for a variety of reasons. The waters are shallow, allowing deeper penetration of light energy. The area is rich in nutrients due largely to the decay of great masses of cordgrass and to the erosion of nutrients washed from the land into streams draining into the salt marsh. Many of these nutrients remain in the salt marsh and many wash out into the bays, sounds, and oceans. They help support primary productivity in those areas. The young of many species of fishes move into the salt marsh to complete various stages of their development. Food is available and protection is more readily come by in the muddy shallows of the salt marsh.

Many species of crabs, shrimp, and shellfish spend varying portions of their life cycle in the salt marsh. The salt marsh serves as a natural protective barrier during periods of storms or extremely high tides.

The salt marsh is seen by John Q. Public as a buggy but otherwise lifeless and smelly area. In addition, he also views the salt marsh as totally useless and placed on earth for the sole purpose of filling in, for real estate purposes or draining in the name of mosquito control.

The salt marsh is being destroyed at an unprecedented rate. A survey of the wetlands in thirteen coastal North Carolina counties was conducted in 1952. A similar survey was conducted in 1967. The two studies were compared and the results showed that in the fifteen year period covered by the study, 45,292 acres or 28.5% of the salt marshes in these counties have been destroyed by filling in, pollution, drainage for mosquito control, dredging for boat marinas, diking by the army engineers, highway construction, canals, and industrial development or expansion.

Who is directly affected by the destruction of the salt marsh? Why should the ordinary citizen concern himself with the plight of the salt marsh? In 1965, there were 5,000 commercial fishermen in the state of North Carolina. During that year their dockside catch was valued at $9,500,000. Sports fishermen spent an additional $32,000,000 in North Carolina during this same period, and in Currituck County alone, hunters spent $500,000. These persons are influenced directly but many others are reached indirectly. The commercial fishermen help support the economy of many coastal counties. The sports fishermen spend money for fishing equipment, charter fees, motel accomodations, and food. It is easy to see how the web of destruction would touch and affect the livelihood of many persons at many economic levels.

In North Carolina one must be issued a permit in order to fill in a salt marsh. The permit is easy to obtain and often ignored. A law without enforcement is a law without use. In the state of Massachusetts, the state can legally zone private property and prevent filling. The Massachusetts Act, hopefully a model for other states, forbids anyone to remove, fill or dredge any bank, flat, marsh, meadow , or swamp bordering on coastal waters without a hearing, a state license, and a biological investigation. "In order to get this legislation passed many civic organizations worked hand-in-hand for five years with biologists, naturalists, and the Massachusetts Department of Natural Resources to study and publicize the plight of the salt marshes in that state. At the time of passage, one-fifth of the Massachusetts tidelands had already been destroyed. In the state of North Carolina, we lost one-third of our tidelands in fifteen years. When will the individual citizens, the civic clubs, the biologist, and the naturalist vote to preserve the salt marshes of our state? Will we wait too long in apathy while a few make their fortunes at the expense of many?"

References: Rewritten from

1. THE LIFE OF THE MARSH by Niering McGraw Hill Book Company

2. Audubon Aid:

   A. "The Wonderful World of Salt Marshes"
   B. "Life in Freshwater Marshes"

3. THE FIELD APPROACH TO COASTAL ECOLOGY by Taylor, Beth (Fall Unit, 2 Edition, September 1969 - Carteret County, Beaufort, N. C. 28516)

STENCIL

SUPPLEMENT # 19

Suggested Questions For The Film "Life Along The Waterway"

1. Did you observe any forms of plant or animal life? (Give an example of each)

2. Was the plant or animal involved in any activity?

3. How did the activity of one animal affect another animal or plant?

4. What non-living things did you observe? (List 3 examples)

5. Did you observe any relationship between living and non-living things?

6. List six natural resources observed?

7. What natural system is being observed?

8. Do you observe changes in the system?
   Are these natural or man-made changes?

SUPPLEMENT # 20

Bibliography To Pre-Activity and Activity

All references for pre-activity, activity, and post-activity are listed here as some may need to be re-used at the various times.

1. Abbott, SEA SHELLS OF THE WORLD Golden Press

2. Cadbury, FRESH AND SALT WATER
   P 44 - 66 The Natural Community in Swamps and Marshes (Fresh water)
   P 66 - 71 Helping Wildlife to Live
   P 72 - 90 The Natural Community of Rocky Coasts (Salt water life)
   P 90 - 108 The Natural Community on Sandy Shores and Mud Flats (Salt water life)

3. Carteret County Public Schools, THE FIELD APPROACH TO COASTAL ECOLOGY, (Fall Unit) Regional Marine Science Project, Student Guide and Teacher Supplement

4. Chapman, THE SEA AND ITS BOUNDARIES Regional Marine Science Project, Carteret County

5. Chapman, THE SEA AND MODERN MAN Regional Marine Science Project, Carteret County, p. 1 - 15; p. 30 - 34; p. 35

6. Creative Educational Society, Inc., ECOLOGY Audubon Aid
   a. Life in Freshwater Marshes/Cowls
   b. The Wonderful World of Salt Marshes/Shomon

7. Dudley, A DAY WITH DON AT CAPE LOOKOUT SEASHORE Regional Marine Science Project, Carteret County

8. Farrar, WILDLIFE OF COASTAL WATERS National Wildlife Federation

9. "A Field Study for a Salt Water Marsh" - Student Handout

10. Gray and Cultrera, SEASONAL VARIATION IN TIDEPOOLS Regional Academic Marine Program; ESEA Title III

11. Gull Lake Environmental Education Project of Michigan State University, BIRD MIGRATION MAP (Major Flyways)

12. Hon and Chapman, TREASURE HUNT: LIFE OF THE SOUND Regional Marine Science Project, Carteret County

13. Humphrey, WHAT'S ECOLOGY Ecology Action Educational Institute p. 29 and 31

14. Kircher, OUR NATURAL RESOURCES Interstate Printers and Publishers, Inc.

15. Lonsdale, ATLAS OF NORTH CAROLINA The University of North Carolina Press

16. Linton, Thomas L., NORTH CAROLINA'S COASTAL ZONE MANAGEMENT PROGRAMS Student Handout (Reprint)

Supplement # 20 (Cont.)

17. "Marsh Ecology". Slides and Tape: Gull Lake Environmental Education Program

18. Mattison, MAN AND HIS RESOURCES Creative Educational Society

19. Mitchell, ECOTACTICS. Pocket Books, p. 106 - 111

20. Morgan, WILDLIFE OF LAKES, STREAMS AND MARSHES National Wildlife Federation

21. Niering, THE LIFE OF THE MARSH McGraw - Hill Book Co., p. 9 - 20. p. 49 - 59, p. 82 - 103, p. 163 - 192

22. Parker, ANIMALS OF THE SEASHORE Harper and Row

23. Penn. Game Commission, "Marsh and Water Birds "

24. Reid, POND LIFE Golden Press

25. Resources Corporation (Wilmington, N. C.), A PLAN FOR THE NORTH CAROLINA ESTUARY STUDY COASTAL ZONE

26. Scarff, A TOUR OF MUDFLAT TOWN Regional Marine Science Project, Carteret County

27. Schwartz, MARINE FISHES COMMON TO NORTH CAROLINA, North Carolina Department of Conservation and Development

28. USDI, BUREAU OF SPORT FISHERIES AND WILDLIFE PROGRAMS 1970

29. USDI, BUREAU OF SPORT FISHERIES AND WILDLIFE PROGRAMS 1971

30. USDI, DUCK IDENTIFICATION GUIDE

31. USDI, MAN - AN ENDANGERED SPECIES p. 50

32. USDI, NATIONAL ESTUARINE POLLUTION STUDY: THE FUTURE OF THE NORTH CAROLINA COASTAL AREA

33. Will, John, ESTUARIES - AMERICA'S MOST VULNERABLE FRONTIERS National Wildlife Federation.

34. Zim, BIRDS Golden Press.

35. Zim, FISHES Golden Press.

36. Zim, SEASHORES Golden Press

Supplement # 20 (Cont.)

Cassette Tapes: The Center for Cassette Studies, Inc. Hollywood, California

1. THE SALT IN OUR BLOOD 28 minutes
2. ECHOES FROM DAVEY JONES LOCKER 27 minutes

Films:

1. LIFE ALONG THE WATERWAY Encyclopedia Britannica 11 minutes
2. SEASHORE LIFE University of North Carolina 10 minutes
3. WILDLIFE BABIES Wildlife Resources Commission 25 minutes
4. WORLD IN A MARSH (OPTIONAL) McGraw - Hill Book Co., Film Department. Rental: $15.00 (330 W. 42nd St. New York, N. Y. 10036)

SUPPLEMENT # 21

North Carolina's Coastal Zone Management Programs

Dr. Thomas I. Linton

Department of Natural and Economic Resources

June 2, 1972

North Carolina is a state richly endowed with coastal resources. North Carolina has 2.2 million acres of estuarine lands and waters. The estuarine lands are those areas where the rivers meet the sea. It has been shown through scientific research these are the most productive areas in the world. They are more productive than the intensive farm crops such as wheat, corn, sugar cane, etc.. This estuarine productivity is natural productivity. Cultivation or other man-type activities are not required to obtain these high productivity values. It has been shown that approximately 98% of the marine organisms of commercial and sport importance spend some phase of their life cycle in these estuarine waters. The area serves these specimens primarily as a nursery or feeding ground. The marsh grasses which cover the banks and creeks and the low lying areas at Wrightsville Beach, Morehead City and Nags Head are the main components responsbile for the high productivity in these areas. Marsh grass at the end of its one-year growing period dies and falls into the water. There it is converted to a material that is known as detritus. Detritus is the basic fuel in the estuarine food factory. It is the basis of what we biologists refer to as the "Food Chain". Detritus serves as the major food item for organisms that are microscopic in size. Small organisms are preyed upon and eaten by large organisms and these by yet larger organisms, thus on up the chain until we come to something like a Blue Marlin or a Speckled Trout. The value of the sport fishing and commercial fishing in our coastal waters is a very important item to the coastal residents. But all citizens of the state are influenced in some way by the coastal area. Most of the

Supplement # 21 (Cont.)

citizens of the state, at one time or another, will visit this coastal area of the state. They are drawn there because of the beautiful surroundings they find, and because of the unique fishing opportunities. It is an area that belongs to all the people of North Carolina. All of the people of North Carolina should be interested in its protection and development. In addition, this estuarine area of the North Carolina Coastal Zone is of importance to other parts of the country. It serves as a resting and feeding spot for the ducks and geese from one of the three major routes of water fowl migrating from Canada to the southern streams of this country and foreign countries. We have found through research activities by the Division of Commercial and Sports Fisheries that shrimp tagged in marshes around Baldhead Island were recovered in Fernandino Beach, Florida. Striped bass tagged in Pamlico Sound were caught off Plymouth Rock, Massachusetts. It is obvious, therefore, that the estuaries of North Carolina influence a rather sizeable chunk of the Atlantic Seaboard.

For a great number of years the coastal area was a neglected area, but in recent times this has changed. The changes that were made to counteract the destructive processes that were going on primarily occurred during the 1969 session of the North Carolina General Assembly.

During that session of the Legislature, two very important pieces of legislation were passed: (1) The Dredge and Fill Law and (2) The Comprehensive Estuarine Plan Act. As a result of the first piece of legislation, we have been more effectively controlling coastal land modification work, primarily digging and filling in the coastal wetlands of North Carolina, since the first day of January, 1970. This act required that anyone desiring to do dredging and filling in the Tidelands of the Coastal

Supplement # 21 (Cont.)

Counties of North Carolina first obtain a permit from the Department. The administration of this act was assigned to the Division of Commercial and Sports Fisheries. An application is received by the Division and then circulated to some eight other state agencies. These agencies are, for example; The Department of Administration- for land ownership questions; The Wildlife Resources Commission - for fresh water fish and game consideration; Water and Air Resources - for the water pollution consideration, to name a few. The comments of these agencies are returned to the Division of Commercial and Sports Fisheries where a decision is made to grant or deny a permit application. The main consideration given to whether a permit should be denied or granted is if the public interest is protected. It has been the general policy of the Division upon receipt of an objection from any of the eight state agencies to deny the permit and attempt to set up a meeting between the applicant and the objecting agency in an attempt to resolve the differences that exist. If this cannot be resolved there is contained in the statute, language which calls into being a Review Board. This Review Board is composed of six members. The applicant presents his case to the Review Board, the Department presents its case to the Review Board, the Review Board is empowered by the statute to overturn the decision of the Department, modify the decision of the Department, or uphold the decision. To date, three presentations have been made before the Review Board. Two of the decisions of the Department were upheld and the third case has not been decided to date.

The second piece of legislation that I referred to, The Comprehensive Estuarine Plan, was enacted by the 1969 session of the General Assembly. The legislation required that the Commissioner of Commercial and Sports Fisheries develop a comprehensive and enforceable plan for the estuarine area on the coast. The legislation requires that a final report be submitted to the Governor the first day of January,

Supplement # 21 (Cont.)

1973 for submission to the 1973 session of the General Assembly for their consideration and enactment of any legislation that may be proposed. Through contracts with consulting firms, through resources inventories, land use surveys by departmental and other state agency personnel, we have developed a document which we have entitled "A Plan for North Carolina Estuaries'. We have developed a pilot plan for New Hanover County to show the land type, location of industries, the valuable fish and wildlife resources areas, the critical area (the areas around inlets and the important marsh areas which serve as nursery grounds for so many of our important marine organisms, shrimp, crabs, trout, flounder and other species of this type). Many of you are aware of the unprecedented action taken by the Currituck County Board of Commissioners recently, in which they declared an eight month moratorium for any further development in the Outer Banks...For all the future times, the development of this invaluable resource located in that county. It is in essence an opportunity to sit back for a brief moment and better chart the direction the development will take on the Outer Banks in Currituck County. In my opinion, this is a very wise move. We hope that the materials that we will produce in the comprehensive plan will serve in a similar manner to guide development on the coastal area of North Carolina. In addition to the documents I have described, we have formed a 35 member Blue Ribbon Committee. The Committee is composed of conservationists, developers, state, federal and municipal agency personnel. It is in essence the full spectrum of the people who are involved and interested in the coastal area of our state. We have held a number of meetings and developed a set of goals, policies, and objectives for the state. We have proposed several mechanisms that would hopefully serve to reduce the red tape involved in obtaining the permits required by governmental regulations. As a result of these meetings we have provided to each member of the General Assembly a resume of our activities, and attempted to explain some of the objectives we have

Supplement # 21 (Cont.)

in mind and the benefits that could be derived from the plan.

The activities in regards to dredge and fill operations and the comprehensive Estuarine Plan for the state come at a very crucial time. There is pending in the U. S. Congress a bill which has passed the Senate (S-3507). This bill requires that the state develop essentially the same type of plan and controls on activities in the coastal area of the state, such as we have done here in North Carolina. This bill has been forwarded to the House. A somewhat similar bill has been enacted by the House; therefore, it remains for a joint House/Senate Committee to iron out the differences between the two bills. If this can be done, and apparently it will be in very near future, this legislation could be enacted possibily within the next session of the Congress. If this is done, we will find that North Carolina is in a position of leadership in the process of developing a wise, useful plan for its Coastal Zone. In administering The Coastal Management Program that has been assigned my Division, we have attempted to develop a system wherein we can provide a greater service to the citizens. In attempting to serve in this consulting capacity, we try in every way possible to establish contact with the person in the formative stages of the development of the application. We feel that this gives us a bett r opportunity to advise as to those portions of the application which are acceptable under the guidelines of the state, those portions of the project which are negotiable, and those portions of the project which most probably will be denied. By working with the applicant, by the time the official application is made, many of the serious problems have been overcome and the permit can be handled in a n expedient manner. One of the main objectives that we have in this program is in the form of a stated policy that productive marshlands, particularly the grass that I referred to will not be destroyed. Major modifications involving areas of this type are not

Supplement # 21 (Cont.)

permitted. Limited modification or alteration is one of the negotiable areas that I referred to earlier. This probably is something that is of importance to you as land appraisers. In a situation where you are called upon to appraise coastal land with highland and marshland involved it would be my strong recommendation that these two types of land be considered separately. The high ground is developable under the terms of the regulations and laws of the various governmental agencies, but below the high tide mark is an area that will be maintained in its natural state. It is my understanding that an appraiser views a piece of land, using as a yardstick, the highest and best use concept or not. My recommendation is a matter to be debated, but it is limited to the use, primarily, as a visual aminity to the area. In addition, it produces the marine organisms and water fowl that most of the people who frequent the coast go there to enjoy. Until the state Dredge and Fill Law is amended or repealed and until the 1899 River and Habor Act of The Federal Congress is amended or repealed, there is statutory authority to maintain these areas in their natural state.

STENCIL

SUPPLEMENT # 22

Test - Salt Water Marshes

Name:_____

Period_____ Date_____

Answer on notebook paper.

Multiple choice:

1. One of North Carolina's most valuable and vulnerable natural resources is a marsh.

   a. True b. False

2. A marsh is just a grassy coastal area which has no wildlife at all.

   a. True b. False

3. Geologically marshes are very young. a. True b. False

4. A marsh is an example of an ecosystem. a. True b. False

5. One of the four main dangers to marshes is dredging, filling or draining of the marsh. a. True b. False

6. Many ecologist describe marshes as:

   a. wastelands,

   b. nursery areas for most commercial and sports fish and other marine organisms.

   c. being very young geologically and therefore not really important.

   d. being areas which man should destroy because they are only breeding grounds for mosquitoes.

7. Salt marshes are being destroyed. a. True b. False

8. Phytoplankton are important because:

   a. they provide shelter for over 80% of the marsh organisms.

   b. they are responsible for 70% of the world's photosynthesis.

   c. they help keep the amount of salt in the water at certain levels,

   d. none of these.

Supplement #22 TEST (Cont.)

9. Man affects marshes by:

   a. pouring too much raw sewage into rivers.

   b. overfeeding or fertilizing the water which causes the algae to grow too rapidly.

   c. dumping pesticides and industrial wastes into the water that poison plants and animals.

   d. all of these

10. Twenty-three percent of all our (U. S.) estuaries have been changed by man.

    a. True b. False

11. The most common boundary between the sea and land is either a sandy beach, a rocky shore, or a _____.

12. _____, _____, _____ are several organisms which live in the quiet protective waters of the marsh.

13. An _____ is a system in which living and non-living factors work together.

14. According to Eugene Odum, the _____ is the most naturally fertile area of the earth.

15. Another term for non-living is _____.

16. The term biotic means _____.

17. _____ are the tiny microscopic plant life found in marshes.

18. The typical marsh bottom is mostly _____.

19. Define estuary: _____.

20. _____ are tiny aquatic animals which serve as food for other marsh organisms.

Supplement # 22 TEST (Cont.)

Short Answer:

21-23. List three non-living factors found in a marsh.

24-26. List three biotic factors found in a marsh.

27. Briefly explain why you find living and non-living factors in a marsh.

28. How are you affected by the destruction of salt marshes? (Be specific)

29. List one thing being done to save marshes.

Word Scramble:

30. (ctibio) - living

31. (sstmcoeey) - living and non-living things working together.

32. (trulaan sorrecues) - those things nature has given us to use for our well-being.

33. (csreonvtanio) - management, including the use and preservation of natural resources for the well-being of man, taking into account the total environment.

34. (hsmra) - that special area where fresh and salt water meet forming a grassy area alive with different types of plants and animals.

SUPPLEMENT # 22

Key To Test

1. A True
2. B False
3. B False
4. A True
5. A True
6. B Nursery areas for most commercial and sports fish and other marine organisms
7. A True
8. B They are responsible for 70% of the world's photosynthesis
9. D All of these
10. A True
11. Marsh
12. Several marine organisms (3)
13. Ecosystem
14. Marsh
15. Abiotic
16. Living
17. Phytoplankton or algae
18. Mud-sand (silt)
19. An area where salt and fresh water meet
20. Zooplankton (diatoms)
21. 3 non-living factors
22. "
23. "
24. 3 biotic factors
25. "
26. "
27. Why you find - to maintain balance of nature
28. Economically - many marine organisms in marsh→food
29. Education; wildlife refuges built
30. Biotic
31. Ecosystem
32. Natural resources
33. Conservation
34. Marsh

SUPPLEMENT #23

Teacher's References

1. THE FIELD APPROACH TO COASTAL ECOLOGY (Fall Unit)/Taylor, Beth
   Teacher's Supplement
   Regional Marine Science Project
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2. THE SEA AND ITS BOUNDARIES/Chapman
   Teacher's Supplement
   Regional Marine Science Project
   Carteret County

3. SCIENCE ACTIVITIES (Jan., Feb., March, 1972)
   "Water Pollution" - Part 1 - Background P. 41 - 45
   "Water Pollution" - Part 2 - Field Work P. 26 - 29
   "Water Pollution" - Part 3 - Physical Aspects P. 30 - 35

4. ROWBOAT OCEANOGRAPHY/Hon, Will(Reprint)
   National Science Teachers Association
   1201 16th Street, N. W.
   Washington, D. C.
   (Reprint - The Science Teacher, Vol. 38, #1, January 1971)

5. AN INTRODUCTION TO THE COLLECTION, PRESERVATION, AND IDENTIFICATION OF MARINE ORGANISMS/Gray
   Regional Academic Marine Program
   ESEA Title III
   Kittery, N. C.

6. THE COLLECTION AND PRESERVATION OF MARINE ALGAE/Gray
   Regional Academic Marine Program
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7. FIELD GUIDE TO BEACHES/Hoyt
   ESCP Pamphlet Series PS -7

UNIT III: SALT WATER MARSHES--ONE OF NORTH CAROLINA'S MOST VALUABLE AND VULNERABLE RESOURCES

INTRODUCTION TO ACTIVITY

TITLE: Field Study of a Salt Water Marsh

TIME: The amount of time depends on the site visited, the location, and the complexity of the study undertaken.

INTRODUCTION:

This section strives to develop not only awareness of the environment, but also active involvement in the environment. By experiencing first hand what they have studied in the classroom, the students will be allowed the opportunity to correlate facts with actual situations. Active involvement in a field study will stimulate interest and participation in other environmental areas.

MATERIALS:

binoculars - 2 pairs
pencil and paper
seine (at least 3-4) students can share
plastic bags (15 qt bags/group)
spade or trowel (at least 5)
yard stick - 3
test kits - dissolved oxygen, carbon dioxide, salinity
post to make stations
coffee cans (9)
long tray or dishpan (4)
grappling bar or rake (3-4)
large test tube (9)
hand lens or magnifying glass (4-5)
buckets (plastic) at least 4
shovel (at least 3)
seines (1 set)
thermometer - 9
pH paper
tape (scotch)
plankton net (9)
12" ruler (9)
water sample bottle (9)
secchi disk (3-4)
bag lunch
any available field guide

ACTIVITY PLANS

UNIT III: SALT WATER MARSHES - ONE OF NORTH CAROLINA'S MOST VALUABLE AND [illegible] RESOURCES

I. Introduction To Salt Water Marsh Field Study

The environment is composed of natural resources which are interrelated and interdependent. The marsh is an environment with many interrelated and interdependent natural resources. This environment will be studied by observing the functioning marsh, by examining individual pieces, and by overlooking the role of parts - individually and together.

Three basic questions will aid in the understanding of a marsh as a natural resource and the knowledge that natural resources constitute the basis of life:

1. What are the patterns? (relationship, cause of certain features, habitats)

2. What are the physical forces that create the patterns? (temperature, turbidity, salinity, chemical analysis, pollution)

3. What happens to the patterns in time, as the forces vary because of cycles or distribution? (man-made and natural distribution)

II. FIELD STUDY (Note schedule - Supplement # 23 Student Field Guide - Supplement #28)

INTRODUCTION

Take students on a field trip to an area where a salt marsh can be studied. Have them investigate the area and complete the information requested on the data sheet. This unit has been designed around a field approach, and needs a visit to a marsh. Anticipation of the field trip will add a sense of immediacy and reality to the classroom discussions. When the unit is complete, the students who have taken a trip will have a different relationship with a marsh than if they had only talked about it. That difference is observable and significant. However, there are problems. A field trip to a salt marsh is, at best, messy. Carelessly handled, it can be a nightmare from the first forgotten permission slip to the last irrate parent picking up her child with a cut foot. The difference is in your attitude toward the trip. You know the children will be thinking of it as a chance to break out of the classroom strait jacket.

If you also think of it as a diversion or a novelty, you are in trouble. Use the field as an extension of the classroom. Then capitialize on these advantages which a salt marsh has over the classroom. There is proof of much of what you have told them in class. Students often must accept abstract symbols without corroboration, so this is a rare chance to narrow the credibility gap. There is some deviation from what you have told them. This gives students a feel for the transition from generalized statements to specific situations which are never exactly like the text books. Each little hunk of environment IS UNIQUE, BUT LIES WITHIN A BROAD PATTERN. This is a valuable insight.

Soggy feet and mudcaked legs do not detract from the experience--they energize it. There will be individual students who respond poorly, but most will feel a challenge in the physical conditions if you present them with a task they consider worthwhile. Let them waste their time (as they will seem to want to do) and you will take home a boisterous but dissatisfied group. Some of your poorer students (academically) will be most effective in the new situation and their gains can be among the greatest benefits of the trip. Their success may impress other students enough to carry over into the classroom and change their role as class underdogs.

ESSENTIAL PLANNING

Don't let your commendable efforts be spoiled by a careless oversight. The minimum planning should include: Getting the principal on your side. Take him with you if possible. Field assistance. If no competent biologist is available, at least have someone to stand by throughout the trip so that minor emergencies will not destroy the whole field trip. This person should have a car if the group has come by bus, so that you do not have to be stranded if he has to take some student back to civilization. Transportation. Routine if you have a bus, remember if using cars, that students will be muddy to their knees unless you have some way to rinse off. Remember, however, that bus drivers must be specially qualified. Clothing. Have students change clothes. Students conscious of good clothes will miss the spirit of the trip and, in the end, ruin them anyway. Insist that everyone wear shoes. The common tale of woe on seashore field trips is cut feet (oyster shells, broken bottles, tin cans), and tennis shoes will eliminate nine-tenths of the problem. Do not make exceptions. If a student shows up in street shoes, put him on a problem that will keep him high and dry. Field trip site. To find an area of marsh close to school, you may pick a site less ideal than others you know. Such is life. The discussion and the compromise are important. Choose a marsh near a parking place, and a spot in which you can get to water without crossing a tremendous stretch of mud. Try for typical salt marsh conditions, but accept what is available. With careful study, any area can yield fruitful results. Time. Two elements here--elapsed trip time and hour of the day. Check tides and be at the marsh about low tide. The other element is the amount of on-the-site time. Ninety minutes seems about ideal, but an hour can be barely adequate if you keep things humming. Two hours would be the maximum desirable. Transportation and clothes changing would be in addition to this. Weather. A warm rain during a pleasant month would not harm anything, except the girls' hair. Decide in advance what your limits of tolerance are, and have an alternate plan laid out. Equipment. Note introduction to activity.

III. Now that you've got the generalities. Review with students their field guide. Make sure all equipment is available. Refer to supplements #21 and #28.
Time Required: 2 periods.

IV. Directions for marsh transect study. (Supplements #24, 25, 26 and 28)

After you've visited the site (prior to the trip) and have the ecological situation straightened out in your own mind, the problem is to guide the students into a new awareness of what a marsh is and why. It would be a simpler thing to tell them what you know. However, it's demonstrably more effective for them to "discover" these phenomena for themselves.

When a student has "solved" or worked through a problem himself, the knowledge gained is retained longer and is more useful--that is, the knack of discovering is transferable to other situations. Maximum benefit is gained if the students are able to identify and define the problems themselves, but time is a factor here. So are class capabilities.

For the first fifteen minutes or so after the class arrives at the field trip site, your questions can lead and guide them into inquiries about what they are seeing. They will all think that having seen salt marshes before, they are experts at marsh watching. In truth, they have no answers because they haven't known what questions to ask. Get them to wonder for example:

1. What is the relationship between water depth and salinity, and how does this influence plant distribution?

2. How are plants physically adapted to being flooded twice a day?

3. What natural resources are present?

4. Does the animal life vary noticeably from the head of the marsh down toward the mouth?

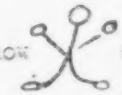
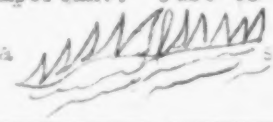
These four examples are just that --examples. The specific questions that you might create to suit your own conditions are infinite. By assigning four or five students to each task, all are kept busy and the discussions which develop in the small groups often are very productive. Enough time should be allowed for each group to do a little exploring, decide on an approach, collect some information and prepare an opinion to be presented to the other students.

Probably, for the first time in their academic experience, the students are going to have an opportunity to report results that are theirs and are the results of their own ingenuity.

As groups are working out their problems, circulate among them. This is an opportunity to discuss with them what they have done and are doing. If you wait to do this when you return to the classroom, the ability to demonstrate your points will be weakened.

SUPPLEMENT #24

A Salt Marsh Field Study

A salt marsh field study! WOW! A what. . .??? By now  should know what a salt marsh is and why it's so important! Just to test, tell me why you think we should have a field study of a  salt marsh:

_____

_____

_____ Great!

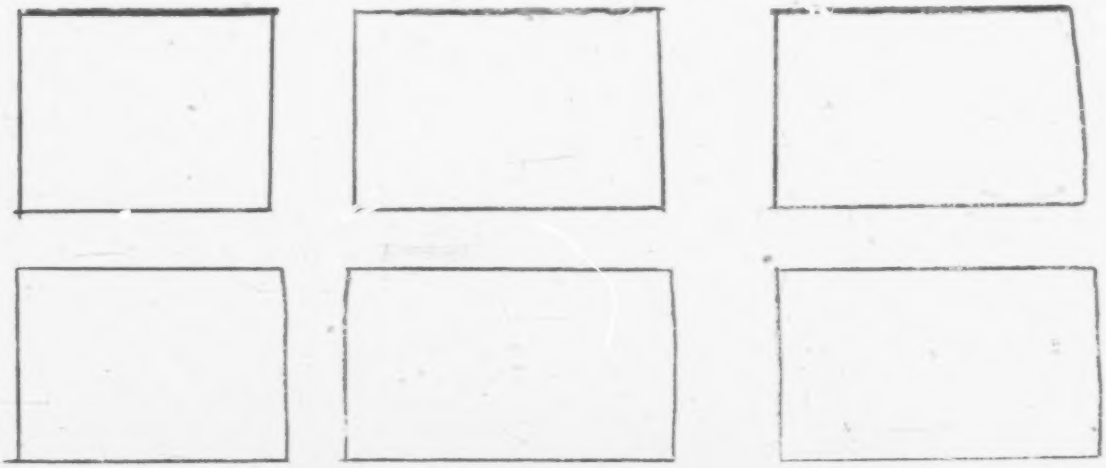
You know the facts, but how many of you have ever been in a salt water marsh? _____ It's messy , but you're outside and experiencing your Environment and Its Natural Resources. Breathing clean air.. . . well breathing at least. You'll also discover that a marsh itself is an environment with many interrelated and interdependent natural resources. What are some of the natural resources of a marsh?_____

_____

You also find that marshes are made of many different types of animals. Name three animals and three plants you might find in the marsh we will study._____

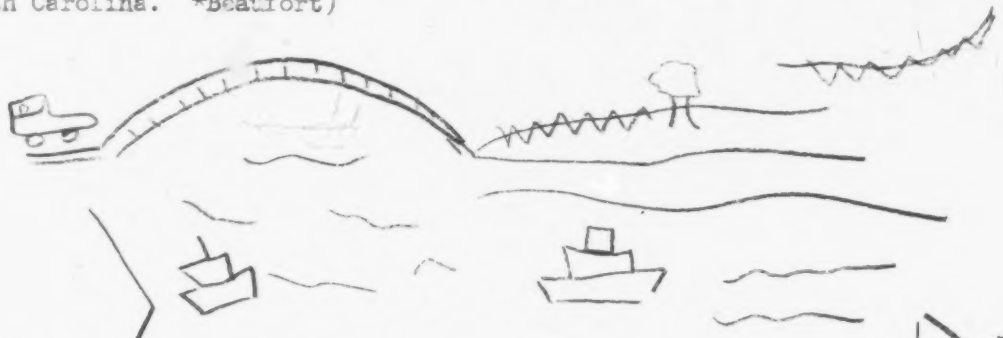
_____

Now you be the artist and draw a picture of the 3 animals and the 3 plants:

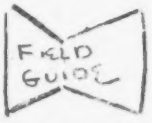


STENCIL

Just where is this marsh located we are going to study? (It's located at Morehead, North Carolina. *Beaufort)



What will we do on the field study? First get a copy of the



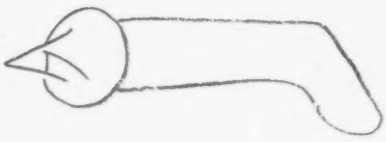
Field Study Guide. Read it carefully!

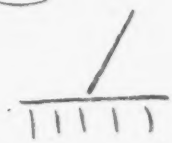
Make your equipment!

1.

2.

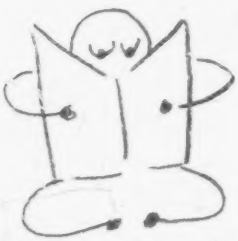
3.

4. 

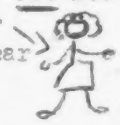
5. 

Learn how to use the test kits!

Just to be certain,



Read your field guide one more time. Ask your teacher if you're still not clear on certain things!



The trip will be fun if:

_____ you are prepared
_____ you have your equipment
_____ and you want to learn about a very, very important natural resource.

SUPPLEMENT # 25

UNIT III: SALT WATER MARSHES--ONE OF NORTH CAROLINA'S MOST VALUABLE AND VULNERABLE RESOURCES

Teacher Reference for Transect Study

The following is a diagram of a marsh transect. Information about each zone is given:

A. Supratidal zone

B. Salt Barren

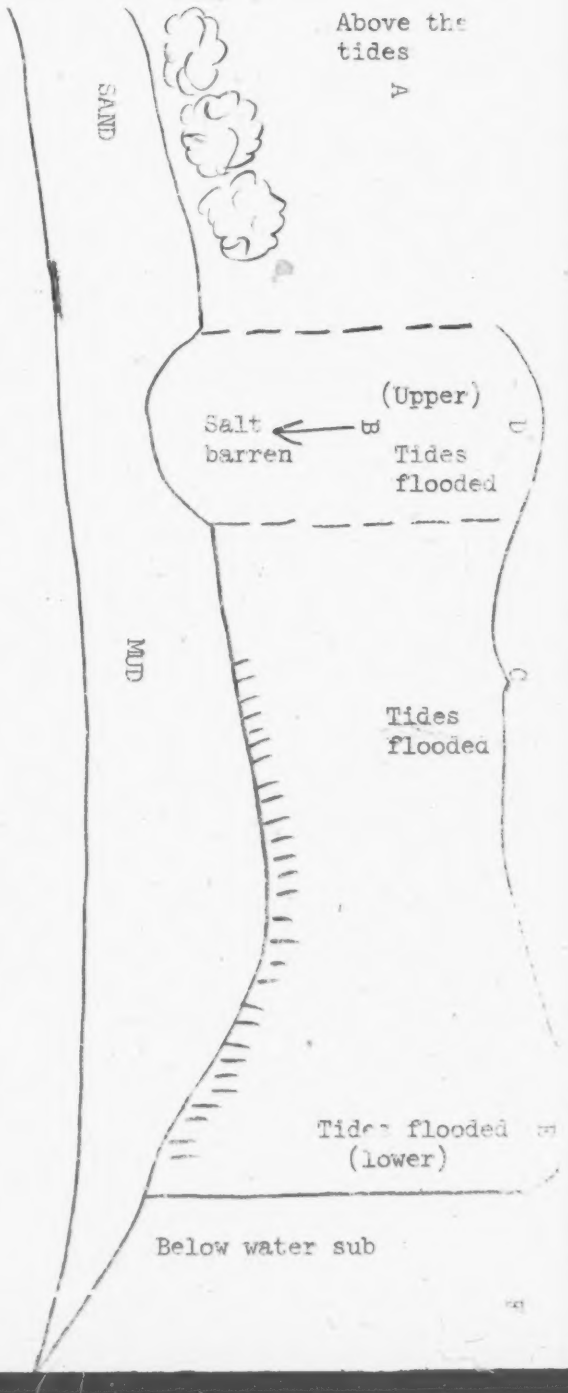
C. Intertidal zone

D. Upper intertidal zone

E. Lower intertidal zone

F. Subtidal zone

In the drier supratidal zone several plants are commonly found growing in close association. The salt meadow cordgrass is generally dominant, but shares the scene with sea ox-eye, spike grass, golden rod and sea myrtle, as well as other plants and shrubs. The salt barren represents a portion of the intertidal salt marsh flooded only twice a month during spring tides or during exceptionally high storm tides. As a result, the salinity content of the substrate is quite high and in some areas prohibits plant growth. The result is a path-like area which meanders about in the higher reaches of the "typical" salt marsh. Glasswort and sp ke grass



grow on either side of the barren and frequently on raised areas within the barren itself. A few stunted individuals of salt marsh cordgrass will generally be found in this area.

The intertidal zone is subdivided into the upper and lower intertidal zones. In the upper intertidal zone, as a result of poor drainage and infrequent flooding, conditions are apt to be quite salty. The salt marsh cordgrass in this area is short, 5-8 inches, and is usually found in association with the dainty sea lavender, glasswort, and the widely distributed spike grass. The lower intertidal zone is flooded with each high tide so less salt accumulates in the substrate. As a result the salt marsh cordgrass grows tall and thick. The height of the cordgrass seems to be directly related to water availability and indirectly to elevation, drainage, and iron content in the substrate and salinity. The needle rush is found in the drier areas of the intertidal zone. It may be found growing on raised mounds in the lower intertidal zone or far back into the marsh where it is reached infrequently by tidal waters. Large strands of needle rush are evident in marshes which flood irregularly.

The subtidal zone is covered by tidal waters at all times. Various large attaching algae seaweeds are present as well as phytoplankton and zooplankton. Eel grass, a flowering plant, grows in clumps along the bottom in the shallows. Close inspection of the eel grass beds will frequently reveal scallops and burrowing anemones.

SUPPLEMENT # 26

Zonation of Plants And Animal in a Salt Marsh

A. Supratidal Zone (above the tides or water)

What you will find:

Plants	Animals
1. blackneedle rush	1. birds
2. seaside goldenrod	2. raccoons
3. spike grass	3. insects
4. salt meadow cordgrass	4. rodents
5. sea ox-eye	5. marsh snail (Melampus)
6. cotton bush	
7. marsh elder	
8. wax myrtle	
9. yaupon	
10. red cedar	

B. Salt Barren (no plants in most saline areas) (flooded only twice a month)

Plants	Animals
1. salt marsh	1. mud fiddler
2. glasswort	2. sand fiddler
3. spike grass	

C. Intertidal Zone

D. Upper intertidal zone (salty)

Plants	Animals
1. salt marsh cordgrass (short)	1. marsh crab
2. glasswort	2. mud fiddler
3. sea lavender	3. sand fiddler
4. spike grass	4. periwinkle (Litterina)
5. blackneedle rush	5. fishes

Supplement # 26 (Cont.)

E. Lower intertidal zone (Less salty)

Plants	Animals
1. salt marsh cordgrass	1. oyster
2. mud algae	2. blue crab
	3. mud snail or basket snail (Nassarius)
	4. mud fiddler
	5. sand fiddler
	6. periwinkle
	7. ribbed mussel
	8. horseshoe or king crab
	9. fishes
	10. marine worms

F. Subtidal Zone (Covered at all times)

Plants	Animals
1. eel grass	1. oyster
2. algae seaweed	2. blue crab
3. plankton	3. mud snail
	4. mottled dog whelk
	5. fishes
	6. marine worms

SUPPLEMENT # 27

Schedule For Field Study

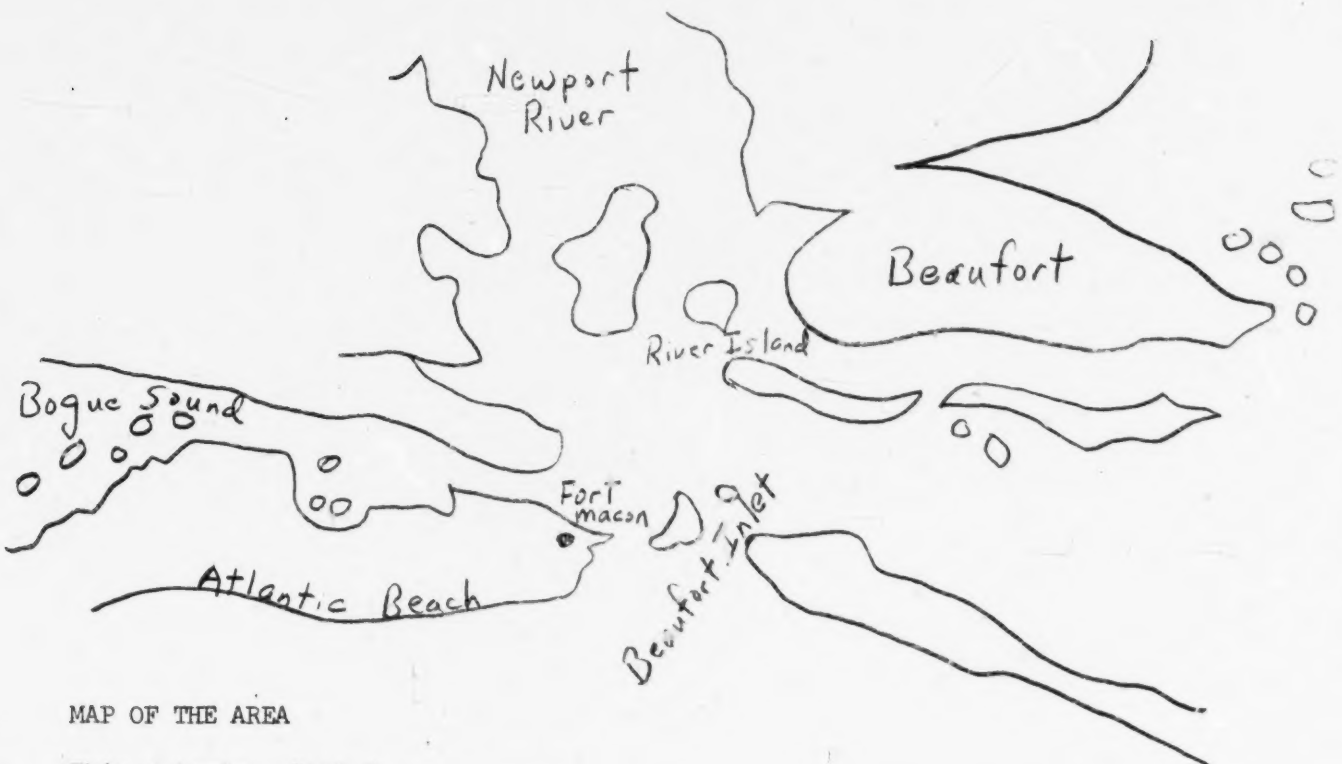
Leave Washington	8:20 A. M.	Arrive at Beaufort	10:10 A. M.
Field Study (Part I)	10:25 - 11:30 A. M.		
Field Study (Part II)	11:40 - 12:40 P. M.		
Lunch	1:00 - 1:40 P. M.		
Leave Morehead	1:50 P. M.	Arrive in Washington	3:00 or 3:30 P. M.

(This time is enough for one field study of one marsh; additional time is necessary for a comparative study.)

STENCIL

TEACHER SUPPLEMENT # 28

Student Guide for Field Study of a Salt Marsh



MAP OF THE AREA

Things to do: Part I

1. Station number:_____ Weather conditions:_____

_____

2. Physical description of your collecting station (make a drawing with labels)

A. Is your area covered by water (none, some, all) of the time?

_____

B. How many different types of plants are found in your area? Only one group member take samples.

SAMPLE #1 NAME _____

SAMPLE #2 NAME _____

SAMPLE #3 NAME _____

(Place other samples on notebook paper and attach)

C. How is each plant physically adapted to the conditions of the area?

Sample # or Name	Adaptation
1.	
2.	
3.	
4.	
5.	
6.	

D. What animals do you observe in your area? (Make a drawing or identify).

E. Does the animal show any special adaptations for this area? If so, what?

Animal	Adaptation
1.	
2.	
3.	
4.	
5.	
6.	

F. Sediment sample.
How to take sample: Scoop up with a coffee can.
What to do: Examine sample and record observation; smell of the sample record observations; place sample in soil sieves, pour bucket of water over sample; record kind and amounts collected.

1. Observation (shell): _____

2. Observation: _____

3. Data collected: _____

_____

G. List three limiting factors in your area? What evidence is present to prove these are limiting factors?

H. Describe any unusual condition or feature in your area. Why does it exist?

I. Review your data. Prepare an opinion of why the particular conditions observed exist within your station or area.

J. Group meeting to listen to and question opinions.

Things to do: Part II

3. Station number _____

4. Plankton Sample (note diagram: Supplement II)
How to take sample: Draw the plankton net through the open water several times (about 2 minutes). Turn wrong side out over dishpan and rinse by pouring a bucket of water over it. Store total collection in a labeled plastic bag.
What to do: First examine the sample with a hand lens. Next examine under a microscope in the lab. Make a drawing of things observed. Identify as many as possible.

5. Collect with seine or bottom net (note diagram: Supplement II)
How to take sample: Do not draw the seine or bottom net through an area of water that has been disturbed. Also it improves efficiency if the nets are dragged along the bottom without any lifting until shore is reached.

Set the net parallel to shore in water three to four feet deep. Face the shore and move toward it with your inside hand holding the top seine line, and the outside hand holding the bottom seine line, which is drawn under your inside foot to keep the net's bottom down. In the crucial maneuver near the shore, the bottom of the net is pulled slightly ahead of the top; then it is scooped up to the shore, and the net is lifted like a sheet from the water.
What to do: Identify (make a drawing if you cannot identify), count, measure, and return to their environment those organisms collected in the seine.

	ORGANISM	NUMBER	LENGTH
a.			
b.			
c.			
d.			
e.			

6. Collect with grappling bar or rake (to collect aquatic plants and the large number of organisms that adhere to plants note diagram: Supplement II).
How to take sample: Pull bottom rake along bottom. Store total collection in a labeled plastic bag.
What to do: In the lab, place the sample in a large tray and drain off excess water, while being careful not to lose any of the organisms. As the material dries, the aquatic organisms will come crawling out of hiding for easy identification.

	Organisms Identified
a.	
b.	
c.	
d.	
e.	

7. Sediment
How to take sample: Scoop up with coffee can.
What to do: Smell of the sample. Record observation. Examine sample and record observation; place sample in soil seives. Pour bucket of water over sample. Record kind and amounts collected.

a. Observation (smell): _____

b. Observation: _____

c. Data Collected: _____

_____

8. Water Sample: note diagram: (Supplement II)
How to take sample: First rinse out sample bottle with water. Allow bottle (with cork in place) to free-fall through water. Stop bottle with a jerking motion at sampling depth.
What to do: Take one water sample at 1 foot or greater depth. Conduct the following test on the water sample. Record depth sample taken at.
Depth _____ feet.

A. Dissolved oxygen. Use test kit. Conduct immediately after taking water sample. Reading:_____

B. Temperature - Hold thermometer in water for several minutes before reading

C. CO_2 (carbon dioxide) - Use test kit

D. Salinity - Use test kit

E. pH - Take a drop of water and let it run down a strip of pH paper.
pH_____

F. Color - Fill a large test tube with water and hold over a white surface. View from the top. Record observations.
Observation:_____

H. Light penetration (optional) Use a secchi disk (note diagram: Supplement II)
How to do the test: Lower disc in water. Depth at which disc goes out of sight is recorded. The disc is raised and depth at which re-appears is recorded. An average of the two readings is taken to get a final reading.

1st reading _____

2nd reading _____

3rd reading _____

I. Questions
- As best you can, describe the type or types of pollution which may or are entering the marsh.

- Is there evidence to show that pollution is present? (You may need to look and walk around)

- How has man brought change to the area and what are the effects? (Cite specific examples)

- If pollution was/is present which organisms would you consider most tolerant and least tolerant of the pollution:

MOST TOLERANT	LEAST TOLERANT
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.

- What particular problems could pollution cause within the marsh and to other areas in the state?

- Could the pollution cause any danger to the people in the area? In other areas? (Cite specific threats or dangers)

J. What natural resources do you observe in this area?

K. Would you classify a marsh as a renewable or non-renewable natural resource? Why or why not?

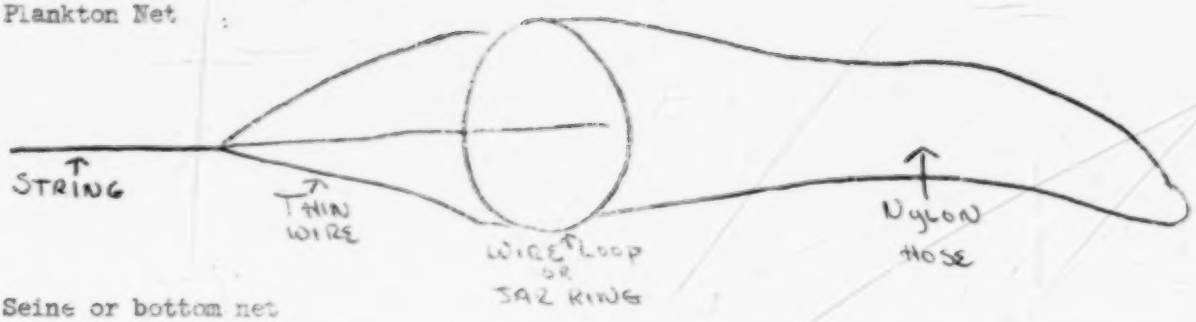
L. Why is this salt marsh ecologically and economically important not only to citizens of Beaufort, North Carolina, but to all citizens of North Carolina? (Be specific)

M. Comparative Study. Part III
Follow the same procedure for the study of the second marsh. Use notebook paper when necessary. Remember we are making a comparison of the two marshes studied.

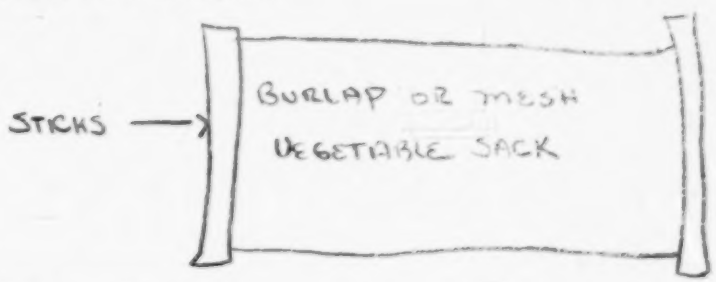
SUPPLEMENT II

Equipment which can be made:

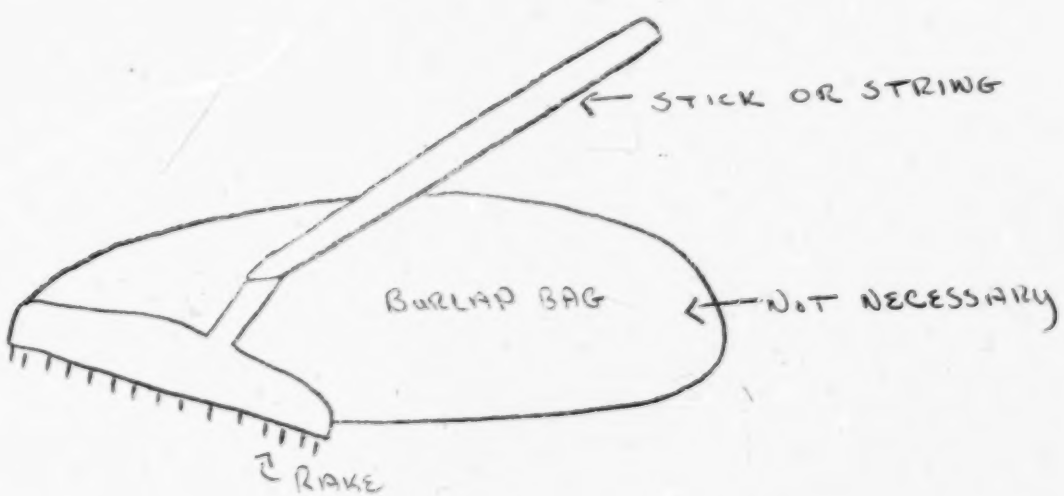
1. Plankton Net



2. Seine or bottom net

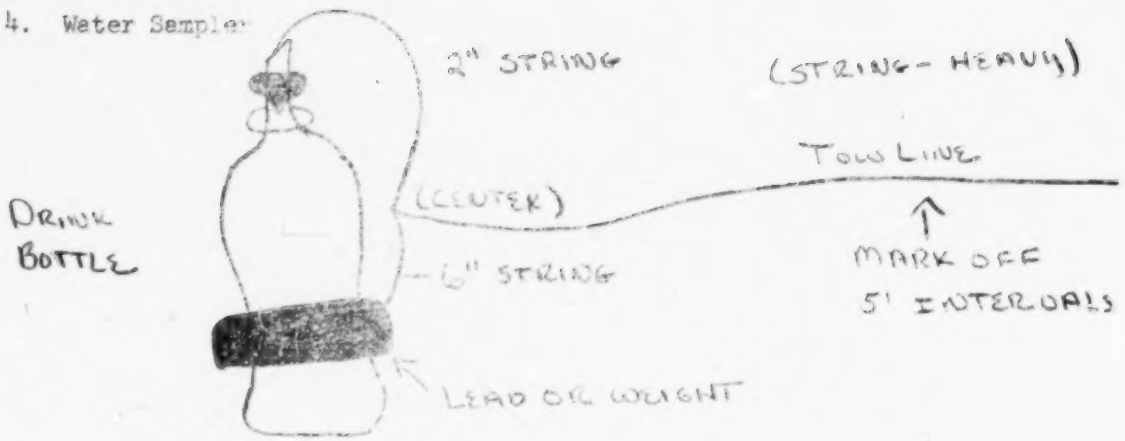


3. Bottom rake

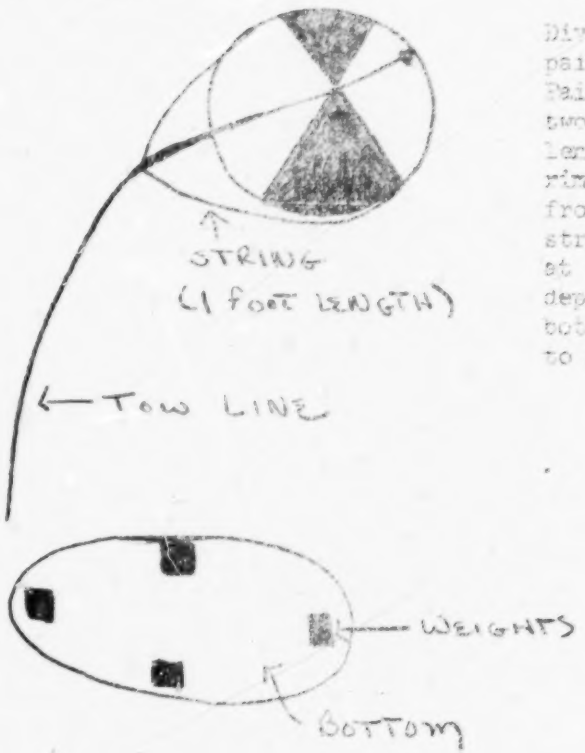


Supplement II (Cont.)

4. Water Sampler



5. Secchi disk



Divide one side of top of a large paint can into four equal pie sections. Paint two opposite sections white and two black. Connect three one-foot lengths of string to the out-side rim so that each string is equidistant from the other. Tie the ends of the string together and connect a tow line at this point. The tow line should have depth measurements on it. Weights on bottom of secchi disc do help the disc to sink at constant rate.

POST-ACTIVITY PLANS

UNIT III: SALT WATER MARSHES--ONE OF NORTH CAROLINA'S MOST VALUABLE AND VULNERABLE RESOURCES

TIME: 3 - 4 periods

I. EVALUATION - INTRODUCTION

Having had time to think over the field trip happenings, the students will doubtlessly have questions. These demand a follow-up evaluation. The purpose is to take a verbal, black-board walk-through of what was done in the field. Again, the secret of making this a good learning experience is skillful questioning: tell little, but ask much. When you ask a question of a student and receive his answer, then ask him how he knows.

After the trip the students should have a better grasp of some valuable ideas. You can evaluate the extent of their learning in follow-up discussions.

II. FOLLOW-UP DISCUSSION

A. Students complete lab work

B. Review student data collected on field trip study

C. Discussion questions to stimulate thinking:

1. Why is photosynthesis basic to the marsh?

2. Does the animal life vary noticeably from the head of the marsh down toward the mouth?

3. What energy cycles occur in the marsh?

4. Using the salt marsh as an example discuss the concept of ecosystem.

5. Why is plankton so important in a marine ecosystem? Why are the waters around the marsh rich in plankton?

6. Discuss the economic value of the marsh.

Post-Activity Plans (Cont.)

7. List and discuss the government agencies that are concerned with the use of natural resources.

HOMEWORK:

8. Conduct a public opinion poll - Ask those interviewed if they think a marsh (a) is an eyesore; (b) just "is"; (c) is beneficial. Why do they think so?

III. Test A Introduction

Two different tests are given. These vary in difficulty so that they are adapted to the different capabilities of students. Encourage students to write organized, specific answers; not vague or emotional answers!

NAME_____ DATE_____

Directions:

1. Answer on notebook paper.
2. Use a cover sheet.
3. Give specific, detailed answers.
4. Share your knowledge of marshes with me.
5. The question should be answered in at least one page, if not more.

Test A (Part I):

Choose one of the following and answer thoroughly:

#1 Imagine the marsh you visited scheduled to be completely walled off and filled with dirt for a large construction project. Which would you rather have, the original marsh or each of these alternatives:

a. weed field

b. corn field

c. waterfront recreation park

d. industrial plant

State your reasons for your choice!

Post-Activity Plan (Con't.)

#2 You have just been appointed to the Office of Natural and Economic Resources. Your first job is to prepare and present a paper to the people of Washington on the following topic: Salt Marshes--Our Most Valuable and Most Vulnerable Natural Resources.

#3 The marsh we visited was polluted. (a) How do you think the marsh became polluted and why? (b) What affect will the loss of this marsh have on the people of North Carolina (directly or indirectly) (c) Why is it so important that marshes can be conserved? (Be specific) Share with me all the knowledge you have of marshes. (d) What are three things you and I (all people in North Carolina) can do to conserve our marshes?

Test A (Part II)

Words: Compare and contrast (Tell how these are alike or different)

1. a marshland and a wasteland
2. biotic and abiotic
3. ecosystem and a marsh
4. phytoplankton and zooplankton
5. oyster and fiddler crab

Post-Activity Plan (Cont.)

V Test B - Salt Marshes

Name: _____

Salt marshes: Along the coast of North Carolina are areas called salt marshes, most of which are more than a thousand years old. "Some ecologist refer to marshes as the kidneys of the local system." During a drive along the outer banks, Atlantic Beach, or any other coastal area in North Carolina one will observe marshes being used for garbage dumps or being filled in to get land for industrial plants or for housing developments.

1. If an ecological system such as a marsh, survives for a long time, what does that suggest about its importance? _____

_____

2. Why are salt marshes present along our coast? _____

_____

3. Which would you rather have in a certain area of our coast, and why? Select only one.

   a. salt marsh _____

   _____

   b. a housing development _____

   _____

   c. a boat marina _____

   _____

4. Do you think people should use marshes as garbage dumps and fill them in for land development? (Why or why not) Use back of this sheet.

5. If every salt marsh in North Carolina were filled in for development what affect, if any, would this have on you and your quality of living. Be specific!! Use back of sheet for answer.

THE CONSERVATION OF NORTH CAROLINA'S NATURAL RESOURCES

Unit IV: Conservation

Pre-Activity I	5 periods
Pre-Activity II	3 periods
Activity	8 periods
Post-Activity	2 periods
	18 periods

Films:

Pre-Activity:

1. "The Prairie Killers" 30 minutes
   NSC--1230; Audio-Visual Center Indiana University
   Rental: $11.50 Scheduled dates _____ or _____

2. "The Persistent Seed" 15 minutes #22;
   (Wildlife Resource Commission) Free
   Schedule dates _____ or _____

3. "Conservation and Balance" 18 minutes Free
   (Wildlife Resource Commission)
   Schedule dates _____ or _____

Activity:

1. "The Whooping Crane" 15 minutes
   (Wildlife Resource Commission) Free
   Schedule dates _____ or _____

2. "Man's Effect on the Environment" 13½ minutes
   (BFA Education Media) Rental $10.00
   Schedule dates _____ or _____

3. "We Share This Land" 16 minutes
   (Wildlife Resource Commission) Free
   Schedule dates _____ or _____

TO THE TEACHER

Teacher Supplements - Unit IV

Pre-Activity

#31 "The Prairie Killers"

#32 Discovering Your Environment

#33 Recommendations Made to Principal

#34 Individual Environmental Tips

#35 What the Individual Can Do

Activity

#36 Bibliography to Activity

#37 Outline of Conservation Movements

#38 Student Worksheet and Key

#39 Quiz

COURSE: CONSERVATION OF NORTH CAROLINA'S NATURAL RESOURCES

UNIT IV PLAN

UNIT IV TITLE: Conservation

TIME: 18-20 Periods

PURPOSE OR OBJECTIVE:

For students to become knowledgeable and concerned about their local and state environments, and what actions can be taken to maintain quality environments. To recognize that conservation involves the total environment in one way or another.

ABSTRACT:

This particular unit is one of great flexibility. It must be because of the activity that the students will take part in. Perhaps the underlying theme for this unit is "Conservation: To Keep North Carolina Habitable"

PRE-ACTIVITY PLANS

UNIT IV: CONSERVATION

TIME: 8 periods

Part I. Environmental Awareness

Time: 5-7 periods

INTRODUCTION:

The students are to engage in several pre-activities that will increase their environmental awareness. With this increased awareness the students should be more receptive to knowledge pertaining to maintenance or conservation of the natural resources within the environment.

These pre-activities will also allow for observation of students' present attitudes toward the environment and the natural resources.

OUTLINE:

1. 1 period: Set up three activity stations for students. Students begin work on activities. Film: "The Prairie Killers" 30 minutes (Supplement #31)

2. 2-4 periods: Students work on three activities; discuss and present to the class.

3. 1 period: Film--"The Persistent Seed" 15 minutes #22 (The destructive influence of man on the environment)

Homework: Students plan poll of the general public (including family and friends) which they will conduct; students should plan questions (3-4) which will reveal the person's awareness and ideas concerning natural resources and the use of these resources.

4. 1 period: Film: "Conservation and Balance" #95 18 minutes (Importance of conservation)

PRE-ACTIVITY

TO THE TEACHER: The following is the student information required for each of the 3 stations which are to be set up the first day of the pre-activity. The information can be written on notebook paper and taped to the tables or desks to designate the three stations. It is helpful to have at least two copies of the concepts and the activities which reinforce them.

STATION #1

Direction: For each concept you are to choose one activity to do.

Concept #1: Man is totally dependent upon his environment. (Copy the concept)

Activity 1: (a) The year is 1999. It has been announced that certain natural resources in North Carolina and the United States have been exhausted and that every citizen must begin to live without many of the conveniences he now has. List 10 conveniences you could live without beginning tomorrow morning.

Activity 2: (a) Interpret and discuss this statement: "All Flesh is Grass". This may be done in small groups or you may write a paper.

Activity 3: (a) Very shortly we will be going on a camping trip into a wilderness area. You are to plan this trip by listing every item you will need to take. You must justify why you must take each item. (Don't forget you'll have to carry all items on your back.)

STATION #2

Directions: Same as for Concept #1

Concept #2 Man is a part of the environment and not segregated from it. (Copy the concept

Activity 1: (a) Suggest reasons (at least 5-6) why on a very hot humid day in a large city business district it may be difficult to breathe.

Activity 2: (a) Paper-prepare and present a paper on the following question: "Does man have the right to alter the natural environment?"

Activity 3: (a) Go into the schoolyard and list all the things you see that are man's affects on nature. Which ones are really unnecessary?

STATION#3

Directions: Select one of the 2 activities for homework.

Activity 1: (a) Prepare a collage that you think best represents your own interpretation of the following statement: "Man is a part of his environment and not separate from it". (You cannot use new or unused construction paper as backing for the collage.)

Activity 2: (a) Draw a picture, make a collage or dramatically present your own interpretation of a person's responsibility to the environment and the natural resources in it.

(Allow students to use bibliography for activity if necessary) (Supplement #36)

PRE-ACTIVITY PLANS

UNIT IV. Conservation

Part II. Individual Action - What I can do

TIME: 3 periods

1 period: "Discovering Your Environment" (Student handout)--Take the class outside or walk down the block to allow the students the opportunity to make necessary observations. (NOTE: Supplement #32)

1 period: Discuss student observations made at school and at home. Compile recommendations to be made to the principal. (NOTE: Supplement #33 Possible Recommendations)

Discuss activities the students are doing at home.

Student handouts:

1. "Individual Environmental Tips" (NOTE: Supplement #34)
2. "What the Individual Can Do" (NOTE: Supplement #35)

1 period: Reading (This could be homework assignment)

1. EVERYMAN'S GUIDE TO ECOLOGICAL LIVING/Cailliet (S103)
2. ENVIRONMENTAL CRISIS/National Education Association (S409)
3. A PRIMER FOR PEOPLE WHO CARE/Scope (S443)

Teacher Supplements

(References)

Unit IV

#31 Film:#118 "The Prairie Killers" 16mm 30 minutes
MSC 1230 Rental: $11.50
Audio-Visual Center; Indiana University: Bloomington, Indiana 47401

Notes: Before the white man came, the Great Plains were inhabited by Indians, buffalo and prairie dogs. The white man claimed the land, displaced the Indians and virtually annihilated the buffalo. Now, ranchers, displeased that coyotes may kill sheep and that prairie dogs eat grass are upsetting the eco-balance by killing these animals--a prairie dog is a vital link in plains life.

#32 Discovering Your Environment (Prepare stencil as student handout):

Litter, Weathering, and Man's Lack of Action

Modern man is the greatest producer the world has ever known. The more he produces to consume, the more there is to dispose of. Thus, the real problem is what to do with the products he cannot totally consume, or use for further production of goods. Man's first temptation, in many instances is to throw down the unconsumed product in the first place available to him and walk away. This accounts for much of the litter you find in various places.

Using this list, survey the school ground and school building to find unconsumed products which cannot be used for further production and which are left to lie on the ground; also identify those objects or areas which need attention or correction because of weathering and because of man's lack of proper action.

Litter Objects ITEM	TALLY	AREA	Weathering or Man's Lack of Proper Action SUGGESTED CORRECTIVE PROCEDURE
Broken glass	_____	Mud holes	_____
Cans	_____	Car and bike ruts	_____
Cigarette/cigar butts	_____	Soil erosion area	_____
Paper	_____	Objects needing paint	_____
Matches	_____	Drainage problem	_____
Plastic materials	_____	Lack of grass cover	_____
Milk cartons	_____	Decaying materials causing odors	_____

(Remaining portion of stencil on following page.)

#32 Discovering Your Environment (Cont.)

Litter Objects ITEM	TALLY	AREA	Weathering or Man's Lack of Proper Action SUGGESTED CORRECTIVE PROCEDURE
Gum and candy wrappers	_____	Holes in roads	_____
Bottles	_____	Cracked sidewalks	_____
Loose wire	_____	Stagnant water accumulation	_____
Ashes from school incinerator	_____		

Going the Next Step

1. What can you and the teachers in your school do to clean up the litter objects from the school ground and to prevent further littering?

2. List some recommendations that the students and teachers can present to the school administration which will prevent additional areas and objects from being affected by weathering and man's lack of action.

3. Using the list of litter objects or of problems created by weathering or man's lack of proper action, conduct a survey of the area around your home. Note the kind and quantity of litter, and identify objects needing maintenance or repair. After noting the problems in your home environment decide on three of the problems you can tackle which will improve that environment.

#33 Recommendations Made To Principal

Recommendations for improving the quality of our school environment:

1. More trash cans (a trash can is especially needed at the north end of the gym)
2. Localize parking areas
   Suggestion: Park the cars along the side and behind the auditorium rather than at the Industrial Arts Building; put gravel down in the parking area by the auditorium
3. Rope off the grass at the south end of the south building (only the area just at the doors) and plant grass
4. Rope off the bushes at the front of the south building
5. Move south building bicycle racks to the south end of the building so students will have easy access to building entrance
6. Trim all bushes on the campus especially those in front of the south building
7. Rope off all trees so they will not be broken
8. Post a polluter list versus a conservationist list for each grade
9. Sponsor a school wide anti-litter week
10. Fill in mud holes around the building
11. Plant additional grass around the shrubs at the main entrance

#33 Recommendations to the Principal (Cont)

12. Move the bicycle racks at the north building to one location (movement of the racks to the graveled road would prevent more traffic on the grass)

13. Rope off the area by the ball court at the north building and plant grass

14. Plant more trees

15. Suggest that students not ride bikes on the front entrance sidewalk. It is dangerous!

16. Encourage teachers to drive carefully when entering or leaving the campus

17. Encourage everyone to become more concerned about how their activities affect our school environment!

#34 INDIVIDUAL ENVIRONMENTAL TIPS Prepare stencil as student handout:

INDIVIDUAL ENVIRONMENTAL TIPS

AIR POLLUTION

Take a bus
Buy a small car
Use low lead gas
Keep your car in shape
Ride a bike or walk
Keep your furnace in shape

WATER POLLUTION

Use dishwasher and clotheswasher only when filled to capacity
Place a brick in the tank of your toilet to raise the float level and save water
Don't dump trash in water--it is easier to clean up a field than the bottom of a lake
Practice using less water

EYE POLLUTION

Create a park
Clean up a park
Plant flowers, trees, and shrubs
Start an organic garden--use predator method for pest control
Give cooking fat to birds--use egg shells and coffee grounds for garden
Don't litter--encourage others not to litter
Report littered areas to local authorities
Keep your own yard clean and free of litter
Keep litter bags in your car and boat

(Remaining portion of stencil on following page.)

#34 Individual Environmental Tips (Cont)

RE-CYCLE

Don't use disposable diapers
Avoid paper plates and cups
Don't use paper napkins or kleenex
Store food in re-usable containers
Use lunch box instead of bag
Make your own shopping bag
Buy returnable bottles
If you must use throw-aways always use paper instead of plastic
Avoid individually wrapped products
Re-use gift wrappings

INVOLVEMENT

KEEP INVOLVED, KEEP INFORMED

Know how politicians stand on environmental issues
Write letters
Know your rights

GET INVOLVED!!!

SUPPLEMENT # 35

What the Individual Can Do To Ease The Environmental Crisis (Prepare as stencil)

We must create new life styles, new behavioral mores which will reduce waste and the destruction of our environment. The following are only examples:

Stop at two!

Don't smoke or if you do, don't inhale.
Use soap flakes low in phosphate content (Trend, Wisk, Cold Water All, and Cold Power are recommended).
Do not use DDT or other pesticides with long residual effects; these include: Aldrin, Chlordane, DDD, Dieldrin, Endrin, Heptachlor, Lindane, Ovex, Tedion, Thiodan.
Use natural predators, not pesticides.
Buy only bottled materials in returnable bottles. Then return them.
Plant a tree, or two, or three.
Sponsor neighborhood cleanups.
Try to buy supplies in bio-degradable wrappings.
Keep a compost heap of grass, garden clippings, and bio-degradable garbage in your yard. Use this instead of fertilizers.
Start a park.
Don't pave more areas than are absolutely necessary. Plant grass instead.
Drive your car as little as possible. Try walking or cycling.
Resolve now to limit the size of your future family.
Give things you don't need to free stores, needy people, charitable organizations instead of throwing them away.
Start a bird feeding station.
Use less electricity: consider disposing of can openers, electric knives and toothbrushes, self cleaning ovens, electric dishwashers, and other luxury gadgets.
Work out car pools to school, work, etc..
Don't use plastics. They never go away.

Stop at two!

Write to congressmen and senators about your concern for environmental decay.
Don't buy things in alumimum cans.
Educate others about the environmental crisis at every opportunity.
Visit sewage disposal plants and see how they work.
Read every thing you can about the environment.
Don't incinerate leaves, garbage, trash, etc....let them decay naturally.
When you buy your next car buy one with less horsepower than the one you are now using. Considerably less.
Elect public officials who have demonstrated a concern for environmental issues.
Make sure your automobile is properly tuned. It will run better and pollute less.
Use as little tinfoil and plastic wrap as possible.
Avoid using electric appliances during peak hours (5 to 7 PM).
Conserve water. Put a brick or two in the tank of your toilet.
Consume less. If each person reduces his personal over-consumption we'll soon be back in harmony with nature.
Find a dirty hillside, creek, or canyon, beach, or roadside and clean it up.
Insist on stricter laws controlling pollution and demand more rigid enforcement of them.
Start a garden--grow your own fruits, vegetables, and herbs.
Use unleaded gas in your vehicles.

Stop at two!

UNIT IV: CONSERVATION

INTRODUCTION TO ACTIVITY

TITLE: A Conservation Play

TIME: 8 or 9 periods

INTRODUCTION:

Through pre-activities students have begun to formulate certain ideas and opinions about their environment and natural resources. This activity will enable them to state and express these opinions to others. The medium of expression - a play.

MATERIALS:

1. Bibliography - Note Supplement #36
2. Student supplement - Note Supplement #37
3. Student Worksheet - Note Supplement #38
4. Film:
   A. "The Whooping Crane" #23 15 minutes
   B. "Man's Effect on the Environment" #61 13½ minutes
   C. "We Share This Land" #25 16 minutes

ACTIVITY PLANS

UNIT IV: Conservation

CONCEPT: Increasing population and per capita use of resources have changed land to man or natural resources to population ratios.

THEME OF THE PLAY:

As our population increases our desires are evermore demanding.

Act I North Carolina in the Pioneer Day

Act II North Carolina at the Present

Act III North Carolina in the year 1999

Scene I How it could be (the ideal)

Scene II How it might be (not ideal)

Tentative Outline for Activity (NOTE: Supplements # 36, #37, #38)

1 period General organizations--formation of groups

2 periods Reading, group planning preparation (film: "The Whooping Crane")

1 period Re-grouping, organizing--group discussions

1 period Reading (film: "Man's Effect on the Environment")

3 periods Reading, planning, group discussions

SUPPLEMENT #36

Bibliography to Activity (Part I)

UNIT IV: Conservation

TO THE TEACHER: The bibliography is broken into two sections, part I and part II.

Allen, CONSERVING NATURAL RESOURCES McGraw-Hill Book Co.

AUDUBON AIDS Educational Service Department National Audubon Society:
A. "Natural Resources in the City" 14 Good Teaching Aids, NB2
B. "Conservation: To Keep this Earth's Habitable" Bulletins on Conservation NB6
C. "Conservation Fact Sheet"

Becker, RESOURCES FOR TOMORROW Holt, Rinehart & Winston, Inc.

CONSERVING OUR NATURAL RESOURCES 4-H Leader's Guide U. S. Dept. of Agriculture

Gates, THE TRUE BOOK OF CONSERVATION Children's Press (General reading, not factual)

Highsmith, CONSERVATION IN THE U. S. Rand McNally & Co.
Conservation Movement p. 8-50 (Technical)

Hitch, CONSERVATION AND YOU Van Nostrand Reinhold Co. (Excellent)

*IT'S YOUR WORLD Superintendent of Documents, U. S. Government Printing Office
The Grassroots Conservation Story p. 1-18

Mattison, MAN AND HIS RESOURCES Creative Educational Society, Inc.
Resources in general p. 9-14
Conservation of Natural Resources p. 14-19

McNall, OUR NATURAL RESOURCES The Interstate Printers and Publishers, Inc.
Chapter 1 The Character of Natural Resources p. 1 7
Chapter 2 The Economic Value of Natural Resources p. 9-16
Chapter 24 Conservation - Everybody's Problem

Nash, THE AMERICAN ENVIRONMENT (READING IN THE HISTORY OF CONSERVATION)
Addison-Wesley

Parson, CONSERVING AMERICAN RESOURCES Prentice-Hall, Inc.

QUALITY CONSERVATION MEANS QUALITY LIVING IN NORTH CAROLINA U. S. Dept. of Agriculture
Soil Conservation Service

*QUEST FOR QUALITY U. S. Government Printing Office U. S. Dept. of the Interior
(Excellent) General information p. 1-15

*Recommended

Supplement # 36 (Cont.)

Self, YOU AND YOUR ENVIRONMENT: HOW TO KEEP IT LIVABLE K. S. Simon Co.

Van Dyke, OUR ENVIRONMENT, PATHWAYS TO SOLUTION Ginn & Co.
Chapter 2 Conflicting Environmental Values p. 16-22
Chapter 20 The Crisis in the Environment p. 98-99
Chapter 23 The Economy vs the Environment: A National Debate p. 107-112

Filmstrips:

"Conservation For Today's Americans"
1. "Soil Conservation Today" Society for Visual Education, Inc.
2. "Land Conservation Today" Society for Visual Education, Inc.

Films:

"Environment" Distributing Service: BFA Educational Media

"The Whooping Crane" Division of Education: Wildlife Resources Commission

SUPPLEMENT # 36

Bibliography to Activity (Part II)

UNIT IV: Conservation

TO THE TEACHER: This part of the bibliography is specific to each of the three acts and is most useful in the students' initial planning.

ACT I

Adams, THIS IS THE AMERICAN EARTH Sierra Club, Chp. 1-3

Allen, CONSERVING OUR NATURAL RESOURCES McGraw-Hill Book Co., p. 9-17

American Education Publication Unit, THE CONSERVATION STORY p. 3, p. 6-21

Clepper, ORIGIN OF AMERICAN CONSERVATION The Ronald Press Co., p. 3-15

Dasmann, ENVIRONMENTAL CONSERVATION John Wiley & Sons, p. 1-24, p. 55-86

Mattison, MAN AND HIS RESOURCES Creative Educational Society, Inc., p. 16-19

McNall, OUR NATURAL RESOURCES The Interstate Printers and Publishers, Inc., Chp. 3, p. 19-25

Worth, MAN, EARTH AND CHANCE Coward-McCann, Inc., p. 43-66

FILMS:

"We Share This Land"	16 minutes
"Which is My World"	25 minutes

TAPES:

"The American Wilderness"	27 minutes
"The Cry For Conservation"	26 minutes

Supplement # 36 (Cont.)

ACT II

Adams, THIS IS THE AMERICAN EARTH Sierra Club, Chp. 4-5

Allen, CONSERVING OUR NATURAL RESOURCES McGraw Hill Book Co., p. 17-22

American Education Publication Unit, THE CONSERVATION STORY p. 3; p. 23-38

Clepper, ORIGINS OF AMERICAN CONSERVATION The Ronald Press Co., p. 168-179

Dasmann, ENVIRONMENTAL CONSERVATION John Wiley & Sons, p. 1-24; 273-288; 299-314

Mattison, MAN AND HIS RESOURCES Creative Educational Society, Inc., p. 114-118

McNall, OUR NATURAL RESOURCES The Interstate Printers & Publishers, Inc., Chp. 3; p. 19-25

USDI, ITS YOUR WORLD p. 88 94

Worth, MAN, EARTH, AND CHANGE Coward-McCann, Inc., Chp. 7; p. 67-78

FILMS:

"The Second Side"	14½ minutes
"We Share This Land"	16 minutes
"Which is My World"	25 minutes

RELY ON NEWSPAPERS

TAPES:

"The Cry For Conservation"	26 minutes
"The Longing For Nature"	24 minutes

Supplement # 36 (Cont.)

ACT III

Adams, THIS IS THE AMERICAN EARTH Sierra Club, Chp. 6

American Education Publication Unit, THE CONSERVATION STORY p. 3; 39-46

Dasmann, ENVIRONMENTAL CONSERVATION John Wiley & Sons, p. 1-24; 87-98; 331-349

McNall, OUR NATURAL RESOURCES The Interstate Printers & Publishers, Inc., p. 269-276; 279-288; Chp. 24

Worth, MAN EARTH, AND CHANGE Coward-McCann, Inc. Chp. 8; p. 79-92

FILMS:

"We Share This Land"	16 minutes
"Which Is My World"	25 minutes

RELY ON NEWSPAPER ARTICLES.

TAPES:

"The Big Snow Job"	27 minutes
"The World as a Wastebasket"	29 minutes
"The Cry For Conservation"	26 minutes

Activities which may help to yield information:

Act I

1. Interview elderly citizens to compare the life style of the town years ago with today in terms of population, industries, and natural resources present then and now.

2. How did changes occur?

3. What important factors were invloved?

4. Did anyone plan these changes?

Act II

1. List and discuss government agencies concerned with the use of natural resources.

2. Bring in newspaper advertisements of cheap commodities. Discuss life span, durability, efficiency of and impact on natural resources.

3. Interview a person who is employed by Texas Gulf Sulphur, Weyerhauser, a wildlife biologist, a person who works for Moss Planning Mill, and a fisherman (livelihood).

   Next interview someone whose livelihood does not depend directly on natural resources. What is each person's attitude toward natural resources and the conservation of them?

Act III

1. Topic: "Cheaper by the Dozen" (What meaning does this have for us today?)

2. Plan ways in which we can systematically lower our living standards. How necessary is this for our future survival?

SUPPLEMENT # 37

References

UNIT IV

TO THE TEACHER: These notes may be given as a lecture or handout to the student. It is helpful if this information is given to the student at the very beginning of the activity.

Outline of Conservation Movements

I. Beginning of Conservation

The general attitude toward natural resources in America was that natural resources were unlimited.

A. Men were laying waste to the natural resources
-passenger pigeon became extinct
-land erosion resulted, eventually Dust Bowl (1930's)
-forests were destroyed

B. Two philosophies existed during this period:

Henry David [illegible]	Land Raiders
Rugged individualism, self-reliance but strengthen ones understanding and love of nature	rugged individualism, but increase personal gains through land destruction

C. After civil war (1860's) men who saw what was happening began to emerge and speak out

voice - (1) George Perkins Marsh
(a) wrote Man And Nature warned of results of destroying natural resources, pointed out relationship between one part of nature and another
(2) Railroad promoters (during Grant's presidency) -- grab and get out
land - (a) Homestead Act 1862 (Lincoln) - force to counter-balance land raiders--authorized free landholders, people to take care of land
(3) Major John Wesley Powell (1878) warned of need for irrigation in west

II. The First Wave of Conservation: The Preservationist Phase

A. William Henry Harrison (President 1890's) - legislature gave President power to reserve certain forests - Harrison withdrew 15,000,000 acres of public forest lands from logging and set up reserves (land raiders raged against "back-up of timber")

B. Gifford Pinchot (1898) Chief Forester of U. S. - spoke out for practical management of forests - worked out how to use wood resources with long range plan

C. Gifford Pinchot and Theodore Roosevelt (President early 1900's) - formed team which brought modern conservation into action: <u>all problems are part of one single question</u>
- conference on conservation held (1908); word <u>conservation</u> appeared
- battles of conservationist (conservation became the "thing"), or else after view points, thus two main philosophies arose:

Supplement # 37 (Cont.)

Muir's philosophy	Pinchot's philosophy
choicest of natural resources must be preserved, cherished, protected- nature is a "temple"	wise managed use of resources, balanced use - nature is a "workshop"

water - D. Reclamation Act (1902) -creation of dams and canal systems

III. The 2nd Wave of Conservation: The Regulation Phase (1930's) - During 1929 America experienced an economic crash and was plunged in a depression. Franklin D. Roosevelt (President) needed a "new approach" to bring the nation back to its feet, thus he proposed the New Deal with conservation being the key issue.
- Civilian Conservation Corps organized
- Tennessee Valley Authority organized
- Soil Conservation Service formed

wildlife- Pittman-Roberson Act (1937) - taxation of firearms and ammunition to benefit wildlife

The main philosophy present during the second wave was unity.

IV. The Third Wave of Conservation: The Ecological Phase
unity, wholeness, interrelatedness - "one problem"
Two factors must be considered:

1. population explosion - time to look at amount of land and decide what quality of life we want
2. machines (mass progress) - machines have removed man from his close interdependency with the soil

A. Conservation - is a life or death choice
-today conservation involves groups of people working together informing themselves of conditions and then getting action
-problems facing conservationist: pollution, resource shortage, solid waste surplus, oil spills, etc....
-recognition that we have one problem
-recognition that our environment is changing and we're mostly changing
-we must realize what our acts mean: what a mess we're in: how everything relates - we must deal with the world as a whole

V. Where Do We Go From Here?
Yes, our world is in a mess. The pessimist says in ten years we'll have nothing, we will have eliminated ourselves. The optimist says don't worry, we've still got plenty of water, land, and wildlife. Which view point is right? Is there a right view point? How do you feel?

There is a need to be concerned, and an even greater need that you be concerned about your environment. We will survive only if you become knowledgeable and active in conserving our natural resources. Hope exists in you. Things can be changed, but only if you want the change - only, if you want to become an ecological conservationist!

A. What problems face you
- water clean up
- solid waste disposal
- strip mining
- noise
- people

Supplement #37 (Cont.)

B. Ecological approach - everything is related; All resources are related; man must recognize the cause and effect of his actions and how they affect his environment, then put these tools to good and effective use.

SUPPLEMENT # 38

Student Worksheet

TO THE TEACHER: The purpose of the worksheet is to reinforce the students' knowledge of the conservation movements. The use of it is optional. It is most useful during the first of the activity.

Worksheet: Conservation

1. Pioneer man thought natural resources were: limited, unlimited.
2. As a result of this philosophy of pioneer man, the following two things happened:

   a. _____ b. _____
3. State the philosophy of Henry David Thoreau.
4. State the philosophy of the land raiders.
5. _____ wrote the book Man And Nature (early 1800's) which warned of the result of destroying natural resources.
6. The first wave of conservation is known as the _____phase.
7. The first wave of conservation's main spokesman was_____.
8. _____ and _____ is the team which brought modern conservation into action in the early 1900's.
9. State Muir's philosophy.
10. State Pinchot's philosophy.
11. Do Muir's and Pinchot's philosophies compare or contrast? How?
12. The man who said "nature is a workshop" was _____.
13. The second wave of conservation is known as the _____phase.
14. The second wave began in the _____ (year) under the _____administration.
15. What was the "New Deal"?
16. What does the CCC mean? During which wave of conservation was it begun?
17. What was the main philosophy of the second wave of conservation?
18. The third wave of conservation is known as the _____phase.
19. What is the philosophy of the third wave?

Supplement # 38 (Cont.)

20. What are two factors which have contributed to today's environmental problems?

1. _____ 2. _____

21. True or false: Conservation is a life or death choice today.

22. True or false: Conservation faces problems such as resource shortage, solid waste disposal, oil spills, etc., today.

23. True or false: Our environment is made of non-changing, non-related things.

24. What is the ecological approach to solving and preventing environmental problems?

25. What is meant by channelization?

26. Should you, a person living in eastern North Carolina, be concerned about channelization? Why?

27. How do you feel about channelization?

28. What does conservation mean to you?

29. Do you think our environment has problems? Explain. Name three specific problems and solutions to these.

30. Do you think North Carolina has environmental problems?

31. Do you think people in North Carolina are doing something about their environmental problems?

32. Are you concerned about environmental problems in North Carolina? Which specific ones and why?

33. What have you done about the problems in North Carolina or your county, town, or home?

34. State when each of the following happened or was active. Simply put 1, 2, 3:

1. first wave 2. second wave 3. third wave

_____a. Wm. Henry Harrison _____ g. Homestead Act

_____b. Franklin D. Roosevelt _____ h. Chicod Creek

_____c. "New Deal" _____ i. Gifford Pinchot

Supplement # 38 (Cont.)

_____ d. CCC

_____ e. Ralph Nader

_____ f. Super highways

_____ j. Oil spills

_____ k. Muir

_____ l. SCS (when began)

35. The marshes, a topographic region of North Carolina, are characterized by

_____ _____ _____.

36. The Neuse River is located in the following topographic region: _____.

37. North Carolina has no natural resources. (True or false)

38. Natural resources are defined as _____.

39. How do renewable and non-renewable resources differ?

40. List the three topographic regions of North Carolina. _____

_____, _____.

41. Define the following terms:

ecosystem _____

ecology _____

biotic _____

abiotic _____

marsh _____

conservation _____

natural resources _____

SUPPLEMENT # 38

Key To Student Worksheet

1. Unlimited
2. (1) passenger pigeon became extinct; (2) forest overcut; (3) land erosion, Dust Bowl; using up of vital natural resources
3. Thoreau believed in individualism, self-reliance strengthened with love and understanding of nature.
4. Land raiders--individualism, self-reliance but increase personal riches through the the use and destruction of natural resources
5. George Marsh
6. Preservationist
7. William H. Harrison or (George Marsh)
8. Gifford Pinchot, Theodore Roosevelt
9. Muir--preserve the best of natural resources
10. Pinchot--wise use of natural resources
11. Contrast-how? Muir thought certain natural resources should be preserved and not used, Pinchot believed natural resources were given to man to use wisely.
12. Pinchot
13. Regulatory
14. 1930's - Franklin D. Roosevelt
15. FDR's plan for uniting the nation - conservation was the key issue
16. Civilian Conservation Corps second phase
17. Regulate the use of natural resources
18. Ecological phase
19. All parts of the environment are interrelated.
20. (a) Population growth (b) Machines -- technology

Supplement # 38 (Cont.)

21. True

22. True

23. False

24. To recognize that all things are related; that everything functions in maintaining the ecological balance.

25. Channelization is when a stream is straightened, banks sloped, and the bottom cleared.

26. Yes. Because so many of the streams in eastern North Carolina are scheduled to be channelized. Why? Not enough studies have been done concerning the affect of channelization on streams' environments.

27. Personal reaction to channelization

28. Personal definition of conservation. (Hopefully, most will say something like: wise use of natural resources, taking into account the ecological relationships of all things in the environment.)

29. Students are to list three specific problems and solutions to these

30. Yes: Air pollution, water pollution, soil abuse

31. Not enough; what could they be doing?

32. Hopefully most will say yes and tell why

33. Student explains activities he has done

34.

A. 1	E. 3	I. 2
B. 2	F. 3	J. 3
C. 2	G. 1	K. 2
D. 2	H. 3	L. 2

35. Salt and fresh water mingling, grasses, much wildlife

Supplement # 38 (Cont.)

36. Coastal Plains

37. False

38. Those assets or advantages nature has given us

39. Renewable can be re-supplied; non-renewable can not be re-supplied

40. Coastal plains, piedmont, mountains

41. Ecosystem--A system in which living and non-living things work together

Ecology--The study of man's environment and his effects on it

biotic--living things in the ecosystem

abiotic--non living things in the ecosystem

marsh--an area in which salt and fresh water mix and that is rich in wildlife

conservation--the wise use of natural resources

natural resources--the advantages nature has given us to use

POST-ACTIVITY PLANS

UNIT IV: Conservation

TIME: 2 periods

I. Students present play (One period)

   A. Act I

   B. Act II

   C. Act III

II. Evaluation and summation (One period)
   (Note Supplement # 39)

STENCIL

SUPPLEMENT # 39

Quiz: Conservation

DO NOT WRITE ON TEST

I. Multiple Choice:

1. The first wave of conservation was known as the : (a) ecological phase (b) preservationist phase (c) regulatory phase (d) machine phase

2. The team which brought modern conservation into action in the 1900's was: (a) Harrison and Pinchot (b) Pinchot and Muir (c) Muir and Marsh (d) Pinchot and Roosevelt (Theodore)

3. The regulation phase of conservation was introduced with the "New Deal" (1930) by: (a) Franklin Roosevelt (b) Gifford Pinchot (c) Ralph Nader (d) Richard Nixon

4. The third wave of conservation has for its philosophy:
   (a) Preservation of all natural resources
   (b) Population control
   (c) Recognition that the use of natural resources must be regulated
   (d) The recognition that every thing is interrelated, and must not be separated into parts

5. The man who said "nature is a workshop" was: (a) George Marsh (b) Major Powell (c) Gifford Pinchot (d) none of these

6. Which of the following have contributed to today's environmental problem? (a) population growth (b) machines (c) lack of concern of man's part in the balance of nature (d) all of these

7. The third wave of conservation is known as: (a) ecological phase (b) preservationist phase (c) regulatory phase (d) machine phase

8. Today we are in the: (a) first wave of conservation (b) second wave of conservation (c) third wave of conservation

9. One of the first men to speak out for conservation was: (a) Skipper Bowles (b) George Marsh (c) Ralph Nader (d) Franklin Roosevelt

10. The second wave of conservation was known as the (a) ecological phase (b) preservationist phase (c) regulatory phase (d) machine phase

II. True/False

11. Pioneer man thought natural resources were limited.

12. The first wave of conservation was known as the ecological phase.

13. Theodore Roosevelt proposed the New Deal for conservation in 1933.

Supplement #39 (Cont.)

14. Muir stated nature is a temple of which the best should be set aside and not used.

15. The SCS was begun during the regulatory phase of conservation.

16. The population explosion has contributed to today's environmental problems.

17. Conservation is a life or death choice.

18. Conservationists face problems such as resource shortage, solid waste disposal, oil spills.

19. Our environment is a changing, interrelated ecosystem.

20. Marsh destruction is a current environmental issue.

21. Conservation is not really important to a person in North Carolina because our state really has no serious environmental problems.

III. Matching: State when each of the following happened, or when the man was active. Simply put 1, 2, or 3 (1) - first wave; (2) - second wave; (3) - third wave

A. CCC
B. Muir
C. SCS (when begun)
D. Salt marsh destruction
E. Homestead Act
F. Gifford Pinchot
G. Chicod Creek
H. Oil spills
I. Every Man's Guide to Ecological Living by Caillet
J. Franklin D. Roosevelt
K. "New Deal"
L. William Henry Harrison
M. "Stop At Two"
N. Ralph Nader
O. Fish kills

IV. Review

22. Natural resources may be defined as: (a) inorganic elements found in the earth's crust which are non renewable; (b) the advantages or assets nature has given us: the organic and inorganic materials such as soil, water, wildlife; (c) the organic materials found in and on the earth; (d) none of these

23. Salt marshes are being affected by man:
(a) Pouring too much raw sewage into rivers
(b) Overfeeding or fertilizing the water which causes the algae to grow too rapidly
(c) Dumping pesticides and industrial wastes into the water
(d) All of these

24. North Carolina has no renewable natural resources (a) yes (b) no

Supplement # 39 (Cont.)

25. The Pamlico river is located in the (a) mountains (b) piedmont (c) coastal plains.

26. A marsh is an example of an ecosystem: (a) yes (b) no

27. Chicod Creek is a current environmental issue because it is scheduled for: (a) damming (b) channelization (c) a site for an oil pipeline (d) a site for a new branch of TGS

28. North Carolina is an ecosystem. (a) yes (b) no

29. Are you concerned about environmental problems in North Carolina? (a) yes (b) no

30. The mountains and coastal plains are topographically alike. (a) yes (b) no

31. List five natural resources that you will find in North Carolina.

	Natural resources	Problem (Man's affect on)	Correction (Action that can be taken to conserve the resource)
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____
5.	_____	_____	_____

SUPPLEMENT # 39

Key to Quiz on Conservation

I. Multiple Choice

1. b
2. d
3. a
4. d
5. c
6. d
7. a
8. c
9. b
10. c

II. True/False

11. False
12. False
13. False
14. True
15. True
16. True
17. True
18. True
19. True
20. True
21. False

III. Matching

A. 2
B. 2
C. 2
D. 3
E. 1
F. 2
G. 3
H. 3
I. 3
J. 2
K. 2
L. 1
M. 3
N. 3
O. 3

IV. Review

22. b
23. d
24. b
25. c
26. a
27. b
28. a
29. opinion question hopefully all will answer a or yes
30. b

Supplement # 39 (Cont.)

31.

Natural Resources	Problem (Man's affect on)	Correction (action that can be taken to conserve the resources)
1. Forest	forest fires, over-cutting	a. stricter controls on cutting of timber b. less emphasis on so many paper products
2. Wildlife	unlawful slaughter of "disliked" animals	a. stricter laws b. more concern by citizens to practice wildlife management by abiding by game limits
3. Water	dumping of untreated sewage into the waters	a. establish better water treatment plants b. vote for water bonds
4. Land	illegal dumping, uncontrolled development without ecological planning	a. establish landfills b. stricter fines on those who dump illegally
5. Marshes	dumping of raw sewage into these areas; dredging and filling in these areas	a. enforce strict laws regulating dumping of sewage into marshes b. educate the public about the necessity of marshes in the balance of nature

APPENDIX I

#22 - POST TEST

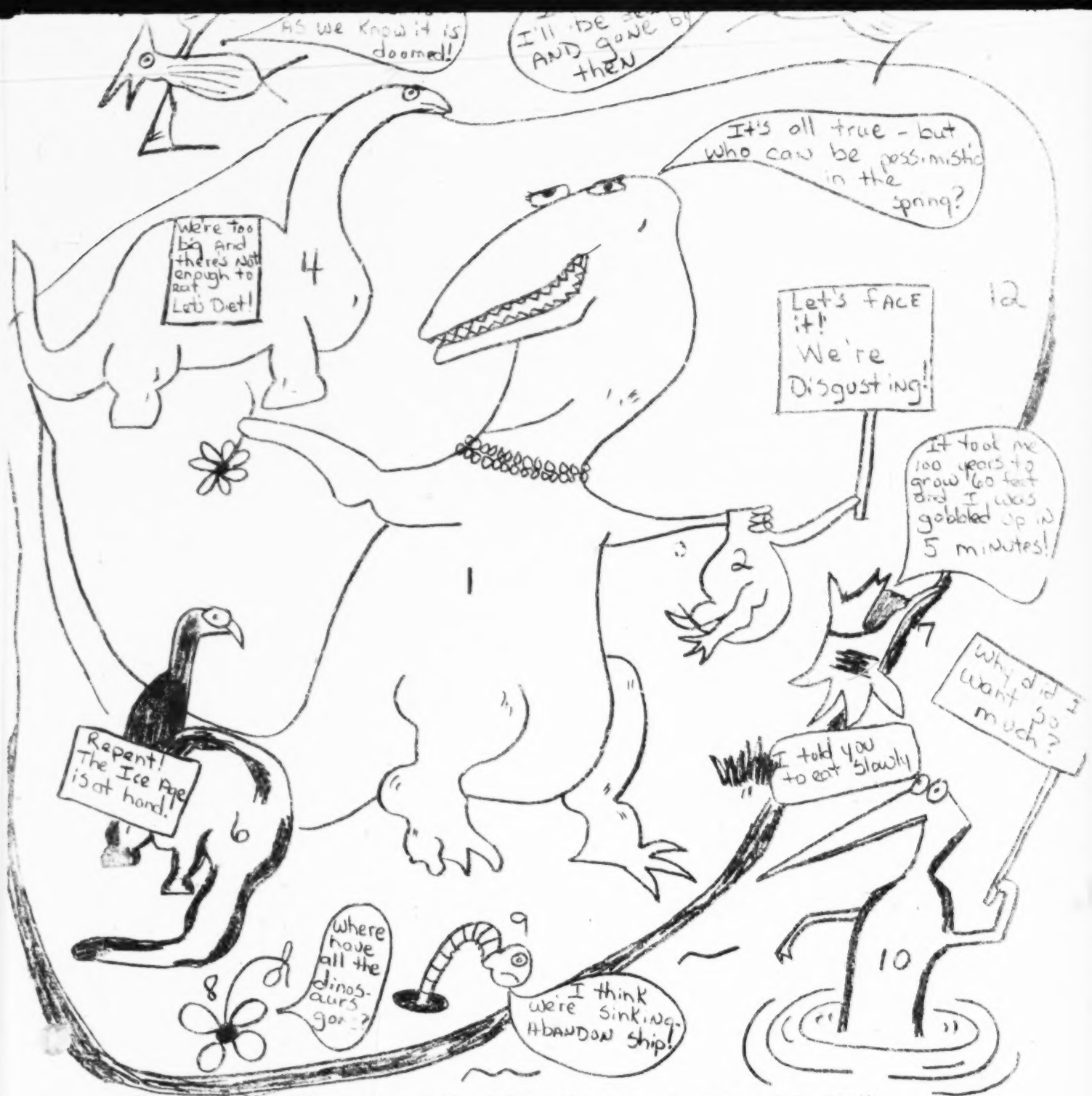
What do you know about the natural resources of North Carolina

and the conservation of these?

1. Look at the pictures below. Read each sign held by each dinosaur. Now answer the questions at the bottom of the page.

5
Civilization AS we Know it is doomed!
I don't CARE I'll be dead AND gone by then
3
It's all true - but who can be pessimistic in the spring?
We're too big and there's not enough to eat Let's Diet!
4
Let's FACE it! We're Disgusting!
12
It took me 100 years to grow 60 feet and I was gobbled up in 5 minutes!
2
1
Repent! The Ice Age is at hand!
6
I told you to eat slowly!
7
Why did I want so much?
Where have all the dinosaurs gone?
8
9
I think we're sinking. ABANDON ship!
10

a. What would the dinosaurs and the island they are on represent in North


As we know it is doomed!
I'll be AND gone by THEN
It's all true - but who can be pessimistic in the spring?
We're too big and there's not enough to eat. Let's Diet!
Let's FACE it! We're Disgusting!
It took me 100 years to grow 60 feet and I was gobbled up in 5 minutes!
Why did I want so much?
I told you to eat slowly
Repent! The Ice Age is at hand!
Where have all the dinosaurs gone?
I think we're sinking. ABANDON ship!
1
2
4
6
8
9
10
12

a. What would the dinosaurs and the island they are on represent in North Carolina today?
b. What do the statements on the signs represent in terms of North Carolina today?
c. What problem(s) are the dinosaurs facing? (List)
d. Do you find any connection between the problems of the dinosaurs and those of modern man and his use of natural resources?
e. Label dinosaur #2, 3, 4, 7, 11 according to the individual group or thing it might represent in North Carolina today. Be specific!

What would dinosaur #1 be saying about the dinosaurs' problem(s) and why would he make the statement if he were:

1. An ecologically concerned "citizen"
2. A politician
3. A conservationist
4. President of a large industrial plant

II. Look at each character. Think about what period of time he belongs to. Decide which statement he would make in answer to this question:

Do you think the people in North Carolina should be concerned about the use of our natural resources?

4. President of a large industrial plant

II. Look at each character. Think about what period of time he belongs to. Decide which statement he would make in answer to this question:

Do you think the people in North Carolina should be concerned about the use of our natural resources?

Match the statements below to the correct character.

a. We've got to tame this wild land and put the natural resources to work. The natural resources of North Carolina are unlimited.

b. Already in North Carolina there are many problems related to natural resources -- dying rivers, polluted air, litter problems. Everyone must realize that our natural resources will eventually run out unless we take care of them beginning now!

c. Progress is essential for North Carolina, and progress is impossible without the use of natural resources. What problems we have with the use of natural resources today can be solved and will be solved by our technology!

d. Everyone -- all states including North Carolina must stop this "skinning of the land" and stop the sale of state forest lands. The use of natural resources in each state must be regulated.

e. With the war over, people can begin to be concerned about the use of natural resources. I belong to the Civilian Conservation Corps and we're planting trees, grass, building dams, and doing other conservative things.

III. Answer both questions (a) and (b).

a. Do you think people's attitudes toward natural resources and the conservation of these have changed since pioneer days?

b. If so, explain why there has been a change in attitudes toward natural resources and conservation, or why there has not been a change.

KEY TO PRE - POST TEST

I. Dinosaurs

a. man; a well-balanced ecosystem that is being disrupted; natural resources; the state and its natural resources

b. statements people make about their environment; people's attitudes

c. 1. depletion of natural resources

2. weakening of a complex web of interdependent life

3. over-population

4. negative attitudes; apathy

	PROBLEM	CONNECTION TO MODERN MAN
d. 1.	depletion of natural resources	today we are over-using natural resources
2.	weakening of complex web of interdependent life	use of pesticides; various chemicals that disrupt natural balance
3.	over-population	today there are too many people
4.	negative attitudes	majority of people not aware of sericusness of environmental problems

e. Dinosaur, plant or object	Individual, group or thing it represents today
#2	Man (ecologically-minded)
#3	Characteristic of majority of state's citizens (apathetic citizens)
#4	Industry; ecological group
#7	Natural resources
#11	Conservation group

f. STATEMENT	REASON FOR MAKING STATEMENT
1. When all the natural resources are used up, - how will we survive? We are not considering what our "acts" do to the delicate balance.	Concern for a quality environment - knowledgeable about possible consequences of man's actions

Key for Pre-Post Test (Cont.)

	STATEMENT	REASON FOR MAKING STATEMENT
2.	We must use our natural resources. This state must progress. We need new industries, housing developments, schools, roads, etc. There are plenty of natural resources to meet all our demands. The ecologists are just using scare tactics!	Lack of concern for environment, more concerned with economics
3.	Careless; thoughtless - this type of destruction is needless. If only people would realize that natural resources are limited!	Concern for quality environment; knowledgeable about possible consequences
4.	Natural resources mean progress! Progress means dollars! Naturally our industry cares about the environment, but we also care about satisfying the needs of our customers.	Lack of concern for environment, more concern with economics

II. Match the statement to the correct character.

CHARACTER	CORRECT STATEMENT
#1	C
#2	B
#3	E
#4	D
#5	A

III. a. Yes

b. Pioneer man felt natural resources were unlimited. His use of natural resources was governed by this attitude. Consequently exploitation of natural resources occurred. However, eventually man began to realize that resources were limited and that certain natural resources should be preserved, but that the use of all natural resources should be regulated. Today man is beginning to realize that this regulated

Key for Pre-Post Test (Cont.)

use of natural resources must encompass all environmental components and factors; for our environment is a complex web of interrelated interdependent entities -- all necessary in maintaining a delicate natural balance.

APPENDIX II

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